February 6, 1961
Volume 50, No. 3

OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

AMERICAN DYESTUFF REPORTER

TEXTILE WET-PROCESSING

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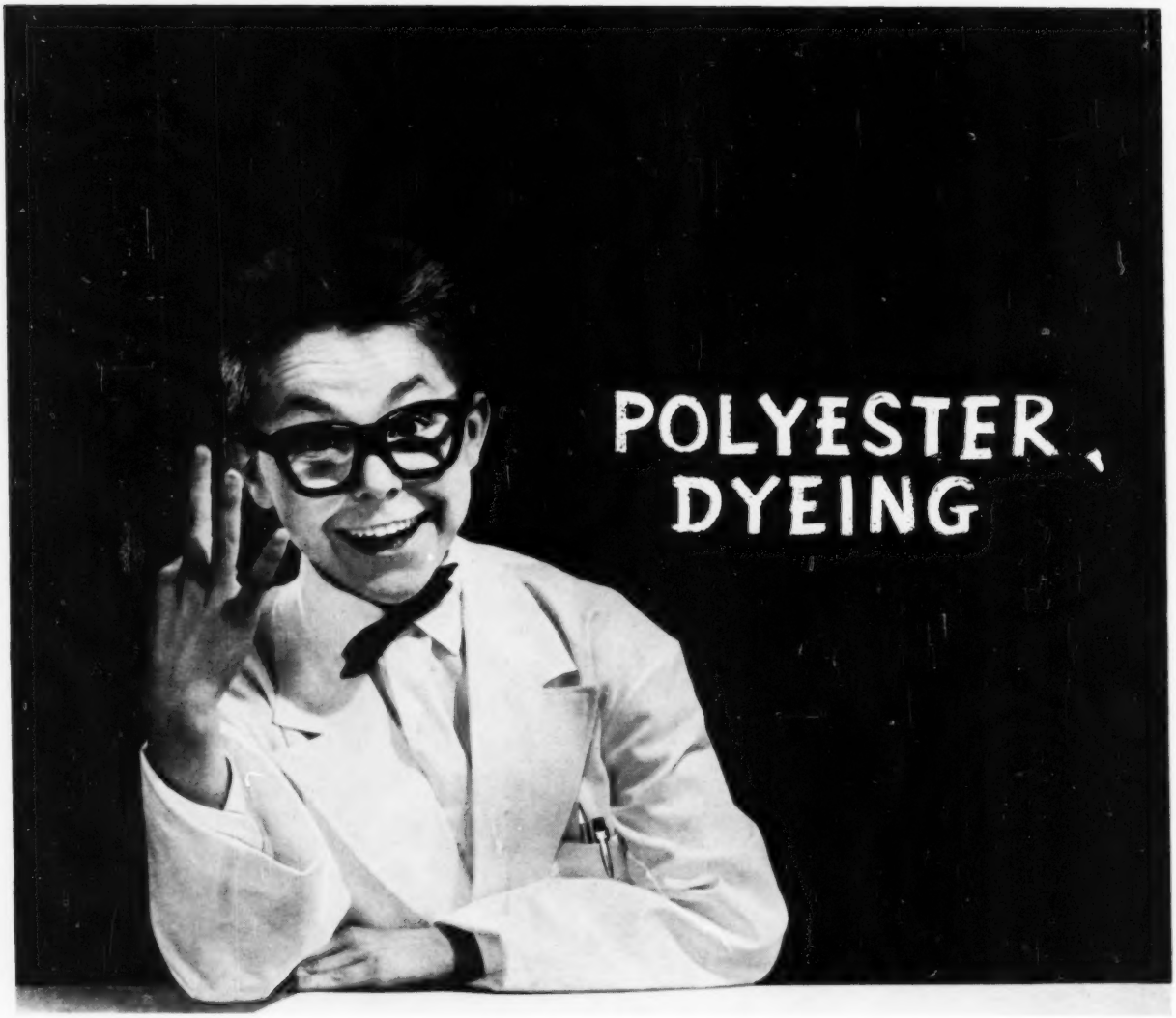

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News about

B.F.Goodrich Chemical *raw materials*

Hycar helps the hunt for new markets,

shows how to improve lofty constructions

Washable and dry cleanable insulated apparel is just one example of the growth market in lofty constructions getting a boost from formulations for spray bonding based on Hycar nitrile latex. Lofty interliner constructions made by spraying with Hycar have excellent resilience and dimensional stability. The problem of shifting or leakage of fiber is minimized.

Even the smaller regional manufacturer may profitably adapt his operations to the production of Hycar spray-bonded battings. Since existing equipment is frequently sufficient, only small additions involving spray and heating equipment may be required.

It may pay off in increased profits to get the complete story of how Hycar nitrile latex can help produce better non-wovens. Here's another example of the service you can get to produce better textiles, for wider appeal, at lower costs. For information, write Dept. PG-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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ICI

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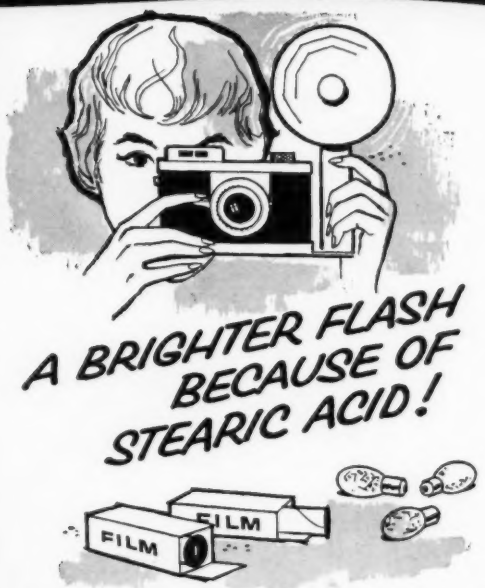
PART OF THEIR "SPARKLE" COMES FROM STEARIC ACID!

An interesting use of Stearic Acid is as an ingredient in "Jewelers Rouge." Buffing and polishing diamonds with this compound brings out their sparkle. Periodic buffing helps keep that sparkle.



A BRIGHTER FLASH BECAUSE OF STEARIC ACID!

Stearic Acid, used as a fine coating in photographic flashbulbs, helps increase their brilliance. Stearic and other fatty acids are also used as ingredients or in the manufacture of camera film, cameras, and film packages.

THEY'RE SHINY NEW AGAIN -THANKS TO OLEIC ACID!

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Below are facts you should know about two Fatty Acids produced by A. Gross. Why not write for samples and additional information on the Fatty Acids we produce. Send for the latest edition of the brochure "Fatty Acids in Modern Industry." Address Dept. ADR-2.

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Color 5¼" Lovibond Red	1.0 max.	1 max.
Color 5¼" Lovibond Yellow	5 max.	8 max.
Color Gardner 1933		2 max.
Unsaponifiable	0.75% max.	1.0% max.
Saponification Value	204 – 207	201 – 206
Acid Value	203 – 206	200 – 205
% F.F.A. as Oleic Acid		99.5 min.
Iodine Value (WIJS)	2.0 max.	90 max.
Refractive Index 50°C. (Av.)		1.4490
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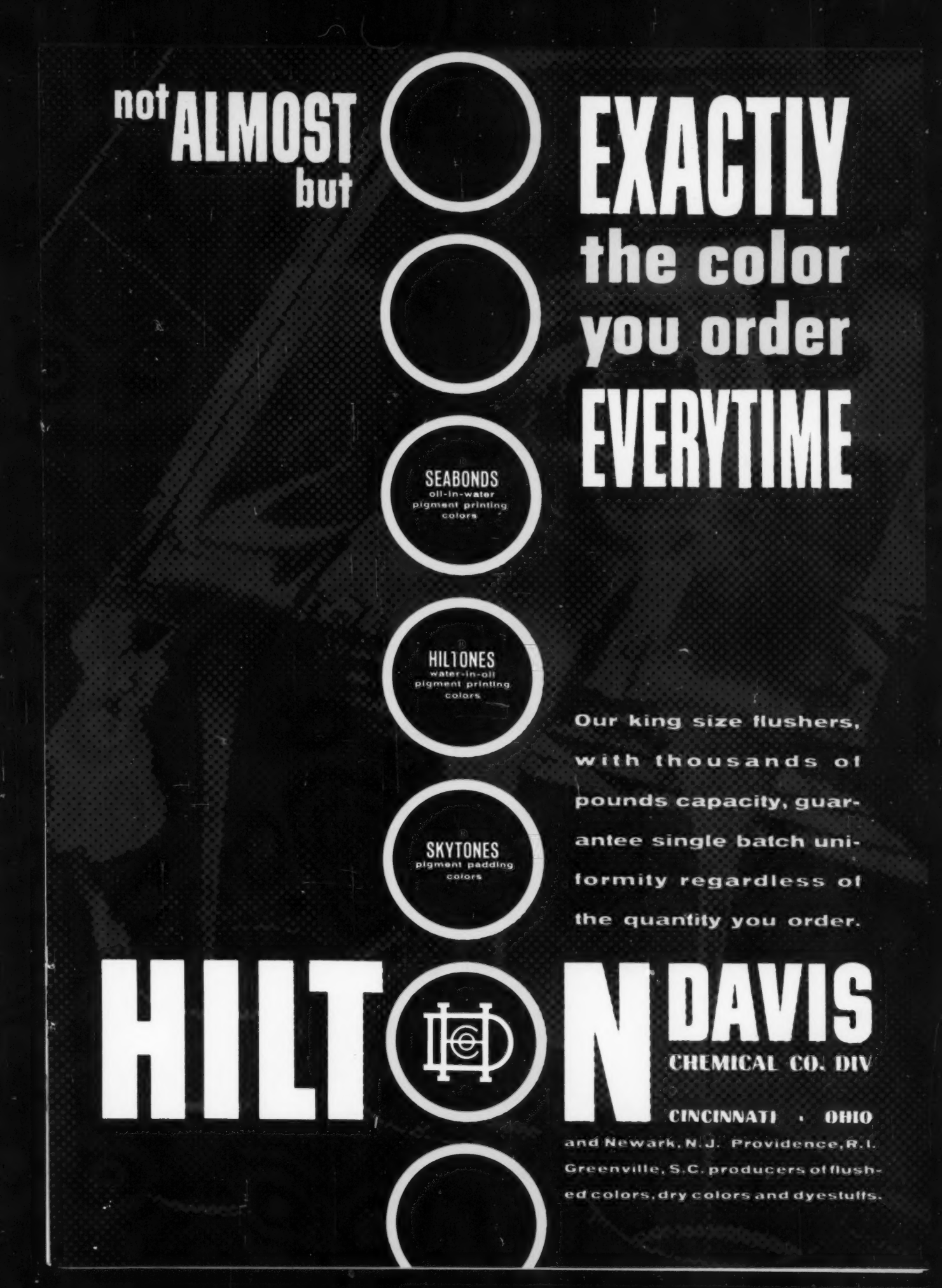
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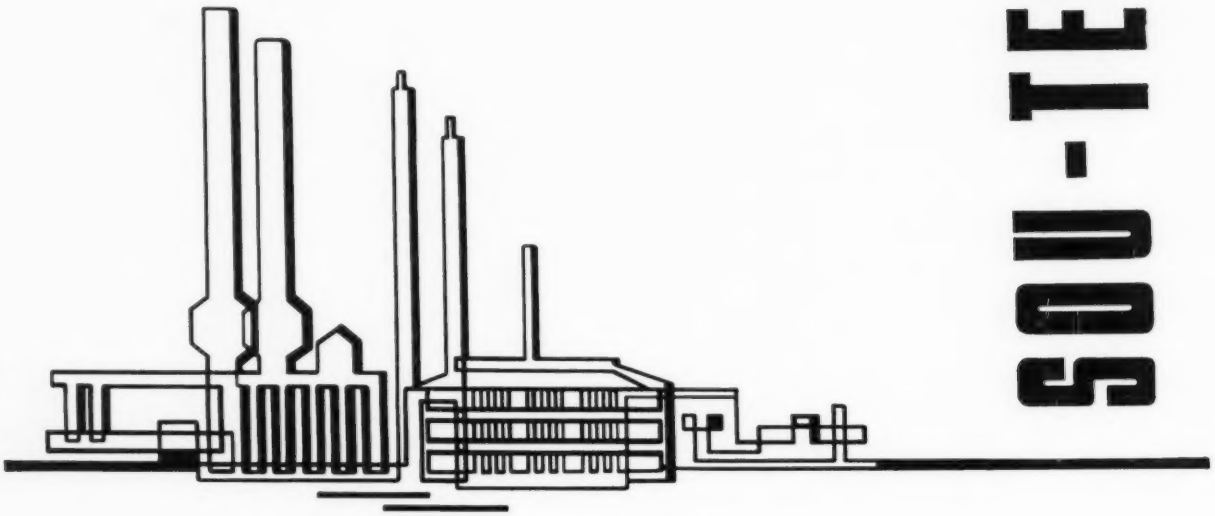

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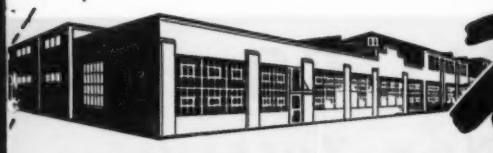

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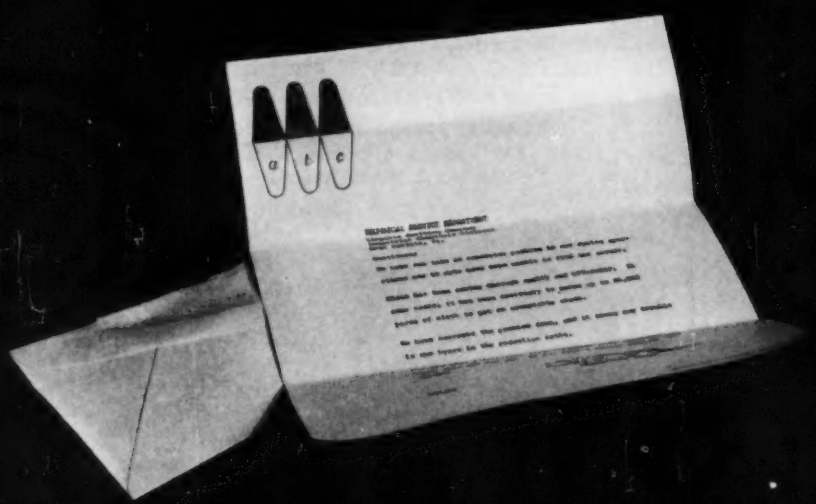
Another example of "Virginia" nationwide technical service

"We have run into an expensive problem...
cloth has been coming through spotty...
our trouble...is in the reduction baths...
send a technical representative..."



Armed with a Redox Recorder, a "Virginia" technical representative was sent to the ailing dyehouse. The reduction bath was tested for potential every ½ hr. around the clock. Our troubleshooter found the defect to be in the method, not the material—the sodium hydrosulfite (a competitor's) was being agitated too strongly in the bath, with rapid decomposition of the hydro. New baths were prepared on the heels of the old ones. More degrading of the hydro. Final recommendation: Cut the amount of hydro used by 25% and save money. The dyehouse management was openly grateful for the know-how the "Virginia" rep had put to use. And immeasurably more so later, for it turned out that annual savings ran up into the thousands. If your company's problems involve a reducing agent, "Virginia" technical service will supply *you* with the same experienced, painstaking attention to details—and get results. For more information write the Industrial Division, VIRGINIA SMELTING COMPANY, Dept. 699, West Norfolk, Virginia.

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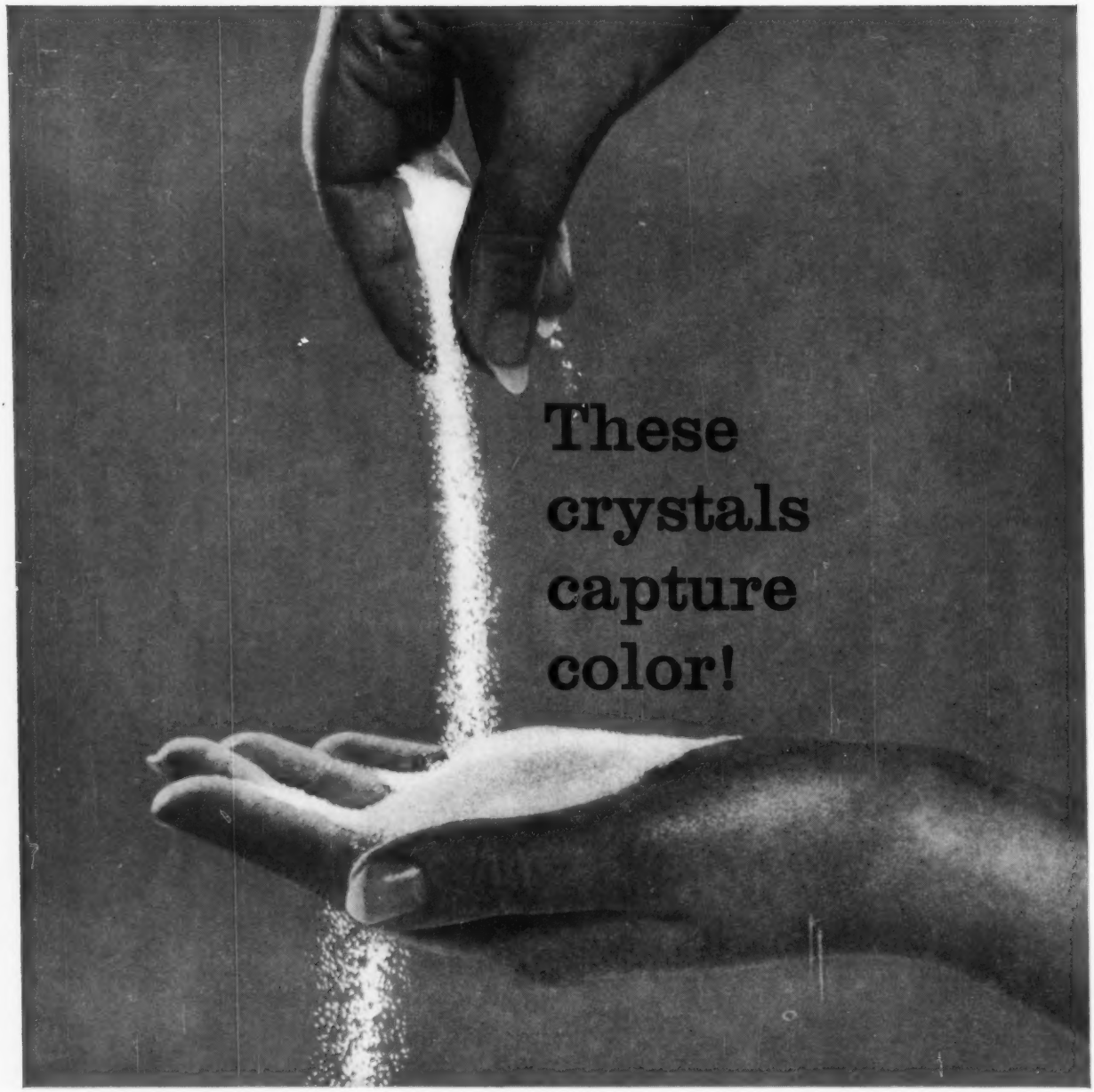

You're looking at crystals of Sterling TNA-5 Reagent.. the reagent that produces clear, brilliant colors in neutral or alkaline dyebaths . . . the reagent that's unexcelled for dyeing cotton,rayon or any blend of these fibers with wool . . . the reagent that improves color quality when used with direct, sulphur or naphthol dyes. Sterling TNA-5 is *more than 99.9% pure*, free of calcium or magnesium impurities that can cause "salt streaks" or uneven shades. An International Salt Company representative will show you how TNA-5 can save money on dyestuffs and improve results in *your* dyehouse. He is experienced in the use of TNA-5, either dry or as brine, and can furnish plans for a TNA-5 dissolver to suit your needs. Contact district office nearest you.

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BULLETIN:

On August 27, 1960, Shell Chemical originated tank truck shipments of hydrogen peroxide in the South to save your company money regardless of its size.

If you are presently buying in drums, read how you can eliminate drum deposits and take advantage of low bulk prices on quantities of 1000 gallons or more.

If you're already buying in bulk, read how Shell Chemical's over-the-road delivery can lower your inventory costs and give you faster service at no increase in price.

THANKS to Shell Chemical, you can now buy hydrogen peroxide throughout the South at *tank car prices* and *over-the-road* convenience.

How drum users save

If you are presently buying 35% or 50% hydrogen peroxide in drums, you can save two ways.

Let's assume your current consumption is 40 drums a month of 35%. The immediate benefit from Shell's tank truck delivery is a $1600.00 increase in working capital by eliminating drum deposits. At the same time you will do away with the bookkeeping, handling and general nuisance of returning drums.

Major benefit: $4500 a year

But the major benefit, of course, is to give you low bulk prices *even if you don't have a railroad siding.* You can buy in quantities of as low as 1000 gallons a shipment. Again using 40 drums of 35% a month, your cash savings can amount to over $4500 a year. At this rate you could pay for excellent storage facilities in 8 months. Everything after that would be pure gravy.

How present bulk users save

Now let's assume you're already buying in bulk. What can Shell's tank truck delivery do for you?

First, it can free 1500 gallons of working capital every time you buy. Instead of taking 4000 gallons at a time, you can take 2500 *at the same low price.* Or you can take as little as 1000 at a very modest increase. Figure for yourself what this can mean in the course of a year.

Every part of the South

The second advantage to current bulk users is faster delivery. Even the most remote part of the South is within two days' drive from Shell Chemical's hydrogen peroxide plant in Norco, Louisiana.

Storage help from Shell

If you do not have storage facilities, you can buy the best on the market for about $3,000. Shell will help you with every step of the installation. That's part of the original tank truck plan as Shell conceived it.

For complete information, contact Shell Chemical's district office in Houston (CApital 2-1181) or Atlanta (JAckson 5-7621). Call today. The tank trucks are rolling. Let them roll your way with savings.

A Bulletin from

Shell Chemical Company

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Industrial Chemicals Division
110 West 51 Street, New York 20, N.Y.

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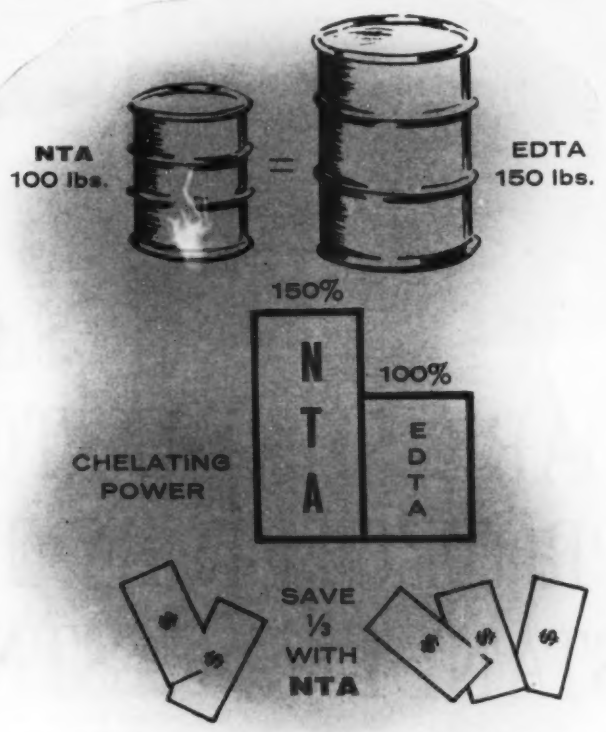

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NTA forms stable mol-for-mol complex compounds with virtually all polyvalent metal ions. In most cases where more than mol-for-mol quantities of NTA are used, the excess amounts of this versatile chelating agent form soluble 2 to 1 complexes which bind the metal ion more tightly than either EDTA or HEEDTA.

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NTA helps reduce ash content, protects dyebaths, promotes level dyeing, increases the detergency of scouring solutions and softens water. Like other chelating agents, NTA aids in the application and processing of resin finishes.

NTA is an effective chelating agent for iron in acid solutions. Like EDTA (Hamp-ene*), NTA should be used with small amounts of HEEDTA (Hamp-ol 120*) or other special iron chelating agents to complex iron in *alkaline* solutions.

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Get the full story of this outstanding line of dyes for polyester fabrics from your Eastman representative.

Eastman Polyester Dyes

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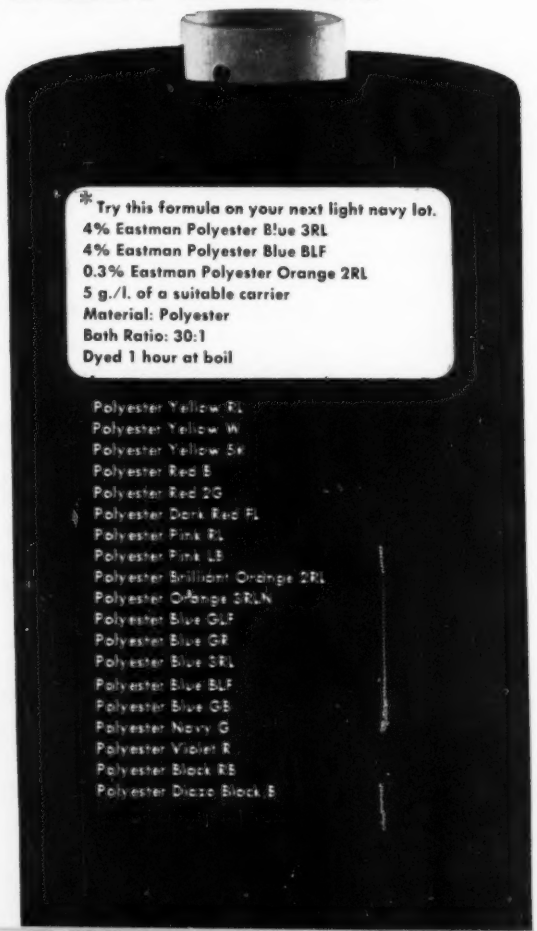

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AMERICAN
DYESTUFF REPORTER
DEVOTED TO TEXTILE WET-PROCESSING

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Wool dress in two tones of Gauguin pink
dyed with National Fast Brilliant Crimson RB
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Peggy Thayer
for House of Jamison Inc.

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inspired by an exclusive new dye...
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DEVOTED EXCLUSIVELY TO TEXTILE WET PROCESSING

ADR

Specially Contributed

THE EFFECT OF LAUNDERING METHODS ON THE WRINKLING OF "WASH-AND-WEAR" COTTON SHIRTS

MELBA BURTON SHILLING and ROSE W PADGETT

Department of Clothing and Textiles
School of Home Economics
Purdue University
Lafayette, Indiana

The wrinkling of "wash-and-wear" fabric, affinity for soil, chlorine retention, odor formation, and reduced strength are recognized problems with some resin-treated fabrics. The major factor investigated in this study was the wrinkling of "wash-and-wear" cotton shirts and fabric.

Shirts in this study were worn between each of the fifteen laundering treatments to which they were subjected. Four laundry methods were used, and three shirts were laundered by each method. Sets of fifteen-inch squares of the "wash-and-wear" shirting fabric were laundered with the shirts in the four laundry methods and by three additional methods.

The wrinkling of the shirts and fabric squares was evaluated by panels according to the AATCC Tentative Test Method 88-1958 and by a photographic method. In addition, a ceiling illumination technique was used to evaluate the shirts.

Wrinkle-recovery angles were recorded for the fabric squares.

The study revealed that various laundry methods affected the wrinkling of "wash-and-wear" fabrics. Different methods of washing and drying produced different patterns of wrinkling. Some wrinkling was defined as rippling and slight creases; other wrinkling was described as a myriad of small, sharp, intersecting creases. The "wash-and-wear" fabric met the suggested standards for crease-resistant finishes.

Information in this article is based on research conducted by Melba Burton Shilling in partial fulfillment of the requirements for the degree of Master of Science at Purdue University, completed in June, 1960. The study was directed by Rose W Padgett, Ph D.

Mrs Shilling was a home demonstration agent with the Indiana Agricultural Extension Service before returning to Purdue for advanced study.

INTRODUCTION

"WASH-AND-WEAR" garments have flooded the market in recent years, promising the consumer freedom from ironing and a more immaculate travel wardrobe. However, the wrinkling of "wash-and-wear" fabric, affinity for soil, chlorine retention, odor formation, and reduced strength are recognized problems with some resin-treated fabrics.

The major factor investigated in this study was the effect of laundering methods on the wrinkling of cotton "wash-and-wear" shirts and fabric squares.

Specific objectives were to determine if:

1) the evaluation of surface wrinkling on fifteen-inch "wash-and-wear" fabric squares can be used effectively to predict the surface wrinkling trend on "wash-and wear" garments;

2) water temperature of 140°F in laundering causes more wrinkling in "wash-and-wear" garments than water at 105°F;

3) action of a tumbler-type home washing machine develops more wrinkling in "wash-and-wear" garments than does gentle hand agitation;

4) garments with straps included in the laundry load cause wrinkling of "wash-and-wear" garments;

5) wearing of "wash-and-wear" garments causes wrinkling;

6) wrinkling in "wash-and-wear" garments increases with an increase in the number of laundering treatments;

7) wrinkling in "wash-and-wear" garments increases with an increase in the weight of the wash load;

8) there be a correlation of test results with the selected wrinkling evaluation techniques; and

9) there be a correlation of panel results obtained from the selected consumer panel of fifty and that of the trained panel of five members.

PROCEDURE

SHIRTS AND FABRIC——White dress shirts made from resin-treated cotton broadcloth and nine yards of fabric obtained from the shirt manufacturer were used. Twelve shirts were worn by three male educators. Each subject was provided a set of four shirts. The shirts were laundered after each of the fifteen wearing per-

iods, pressed lightly with a warm iron when needed, folded, and placed in boxes for distribution to wearers.

The fabric was cut into fifteen-inch squares as specified by the AATCC Tentative Test Method 88-1958 (*2*). A set of six fabric squares was used for each of the seven test methods. Three squares of each set continued through the fifteenth and final laundering, one square being dropped after the first, the fifth, and the tenth launderings.

Shirts were laundered by four of the seven laundering methods, the limiting factors being cost and time.

LAUNDERING METHODS——Seven laundering methods were selected for this study.

Method 1: Hand Wash, 105°F, Drip Dry. Shirts and fabric squares were hand washed in a ten-quart pail containing two gallons of water to which twenty grams of low-sudsing detergent had been added. Each shirt was hand washed individually for five minutes[1] and was rinsed twice for two minutes in two gallons of water at 105°F. The shirts were placed on nonrust rubber-coated hangers to drip dry. The seams were smoothed with the hands, and the top button was secured.

The fabric squares were washed by the same procedure as the shirts, except that the center portion of each square was lightly rubbed for one minute each. The fabric squares were hung by two corners with the warp in the vertical direction to drip dry.

Method 2: Machine Wash, 105°F, Tumble Dry. A four-pound load, consisting of shirts, fabric squares, and three-feet by three-feet cotton sheeting dummy pieces were laundered in a tumbler-type home washer in water at 105°F. The full water level and a ten-minute wash cycle were selected. The washer was allowed to proceed through its usual cycle of wash, three rinses, and spin. The entire load was immediately placed in a dryer at low temperature setting for thirty minutes, after which the shirts were placed on rubber-coated hangers and the fabric squares were hung by two corners with the warp in the vertical direction.

Method 3: Machine Wash, 140°F, Tumble Dry. Shirts and fabric squares were laundered as in Method 2, but the temperature of the water was 140°F.

Method 4: Machine Wash, 140°F, Tumble Dry—Straps. Shirts and fabric squares were laundered as in Method 3, but women's garments with straps were included instead of the dummy pieces to make the four-pound load.

Method 5: Machine Wash, 105°F, Drip Dry. Fabric squares were washed as in Method 2, but were drip dried. The squares were removed from the washer during the final rinse and allowed to drip dry. This four-pound wash load consisted of non-test white shirts in order to maintain the standard test load.

Method 6: Machine Wash, 105°F, Drip Dry. Fabric squares were laundered as in Method 5, but the temperature of the water was 140°F.

Method 7: Machine Wash, 105°F, Drip Dry, One-half Standard Load. A two-pound load, one-half of the standard four-pound load, was selected for laundering fabric squares by this method. Other procedures were as in Method 5.

[1]Collar and cuffs were spot-treated and knuckle-rubbed until the seventh laundering. From the seventh through the fifteenth laundering a soft nylon brush was used on the soiled areas for more efficient soil removal.

Shirts and fabric squares were allowed to condition at 70°F and 65 percent relative humidity for two hours before being evaluated.

STANDARD TESTS —— The wrinkle-recovery angle of the original and treated fabrics was measured by the vertical strip test according to American Society for Testing Materials Designation D 1295-53T (*1*). Monsanto Wrinkle Recovery Testers were used.

TECHNIQUES OF EVALUATING WRINKLING—— A five-member panel consisting of two men and three women evaluated the wrinkling of the fabric squares and shirts after the first, the fifth, the tenth, and the fifteenth launderings.

Fabric squares were evaluated by the technique described in the AATCC Tentative Test Method 88-1958, being numerically rated on a scale from "5" (quite smooth) to "1" (very wrinkled) by each panel member.

The back of each shirt provided a fifteen-inch square area which was evaluated under low-angle lighting conditions by placing the shirt back over a fifteen-inch platform and by elevating the "Cranston Box" (*2*) to the same height as the platform.

The panel rated each shirt, as a whole, using a ceiling illumination technique. White light from an overhead source illuminated the shirts at a twenty-degree angle. Shirts were placed on identical men's display forms in front of a black background and viewed at a distance of six feet.

In addition to rating the wrinkles numerically, panel members responded to the questions, "Is this shirt satisfactory without touch-up for dress wear? For casual wear?" Panel members were asked to indicate factors which influenced their decisions by checking the following points if applicable to the shirt: collar wrinkled, cuffs wrinkled, seams pulled, pocket wrinkled, and/or overall wrinkling.

Polaroid photographs were taken of shirts and fabric squares after the first, the fifth, the tenth, and the fifteenth launderings. Photographs were compared by the panel to the AATCC set of photographic standards for wash-and-wear, and each photograph was rated by each panel member.

A consumer panel of fifty students also evaluated the wrinkling of the fabric squares and the shirts by means of the polaroid photographs. (See Figure 1).

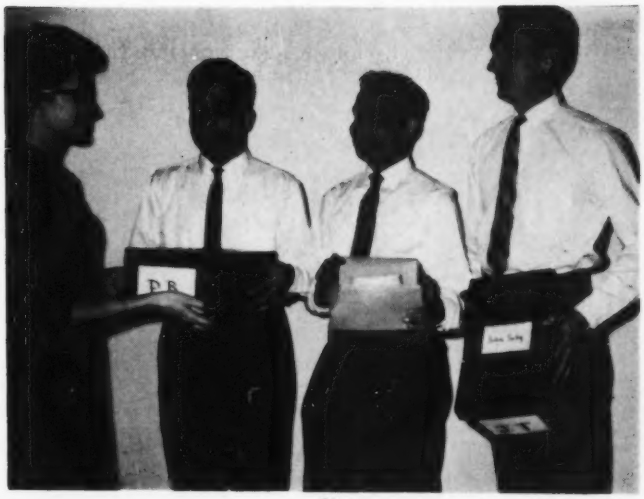
DISCUSSION

The discussion falls into three parts: the "wash-and-wear" shirts, the fabric squares, and a comparison of shirts and fabric squares.

SHIRTS——Panel ratings of the wrinkling of the laundered shirts fell below the 5.0 (quite smooth) rating of the original fabric. When the averages for all evaluation periods were combined, a pattern was established which was repeated by all evaluation techniques, as shown in Table I. In this study the pattern was as follows, in a descending order of panel ratings: 1) hand wash at 105°F, drip dry; 2) machine wash at 105°F, tumble dry; 3) machine wash at 140°F, tumble dry; and 4) machine wash at 140°F, tumble dry, garments with straps included in the laundry load. Ratings for the shirts laundered by the hand-wash, drip-dry method were considerably higher than those for shirts laundered by the machine-wash, tumble-dry methods.

The ceiling illumination technique of rating the wrinkling of shirts produced panel ratings consistently lower than those by the Cranston Box illumination. The

1a



1b

1c

1d

Figure 1
Research procedures for "wash-and-wear" study

1a: "Wash-and-wear" shirts and fabric laundered in the "wash-and-wear" area of the research laboratory.

1b: Subjects wearing "wash-and-wear" shirts and receiving boxed supply of laundered shirts.

1c: Evaluation of fabric squares by Cranston Box illumination. Shirts on forms in background were evaluated against black wall on right.

1d: Members of consumer panel of fifty evaluating photographs of "wash-and-wear" shirts.

TABLE I
Panel ratings of "wash-and-wear" shirts by three evaluation techniques

		Combined average ratings			
		Panel of five			*Panel of 50*
Laundry method	*Rank*	*Tentative test*	*Ceiling illumination*	*Photo-graphic*	*Photo-graphic*
Original		5.0	5.0	5.0	5.0
Hand—105°F Drip dry	1	4.6	4.3	4.3	4.3
Machine—105°F Tumble dry	2	3.6	2.7	3.5	3.1
Machine—140°F Tumble dry	3	3.4	2.6	3.2	2.8
Machine—140°F Tumble dry*	4	3.0	2.5	2.9	2.6

*Garments with straps were included in this laundry load.

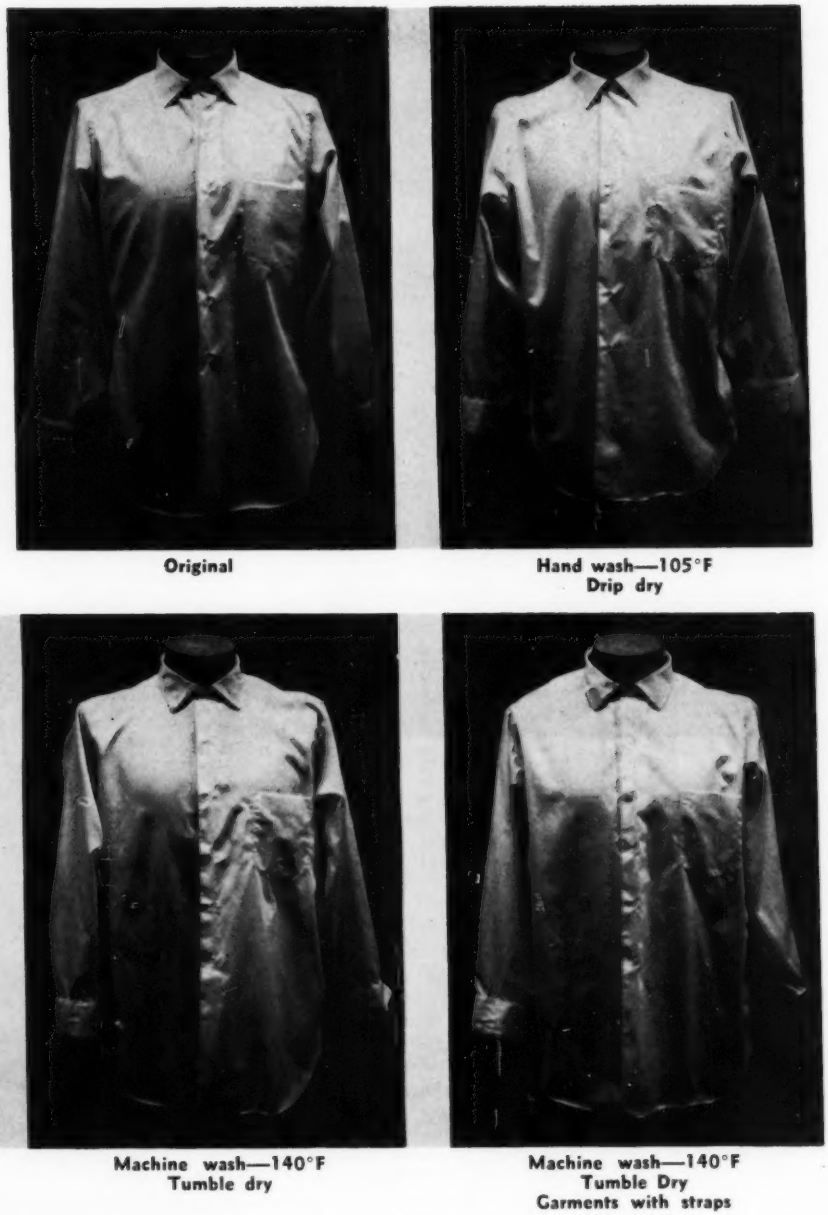


Figure 2
Front view of "wash-and-wear" cotton shirts showing varying degrees of wrinkling after fifteen launderings, placed in a descending order of panel ratings.

Original

Hand wash—105°F
Drip dry

Machine wash—105°F
Tumble dry

Machine wash—140°F
Tumble dry

Machine wash—140°F
Tumble Dry
Garments with straps

photographic technique of evaluating the wrinkling of "wash-and-wear" shirts was used by both the panel of five and the panel of fifty, with similar results. Panel ratings of the photographs fell between the ratings by the Cranston Box and by the ceiling illumination techniques.

Description of Wrinkling. The wrinkling of the "wash-and-wear" shirts after fifteen launderings can be seen in Figures 2 and 3. The original shirt (not touched up) appeared very smooth at the seamlines, the collar, and the cuffs. The original fabric of the shirt was smooth, except for a line across the upper front and back where the shirt was folded in storage.

The treated shirts represented varying degrees of wrinkling of the fabric. The hand-washed shirt, which was rated much higher than the machine-washed shirts, appeared smooth, but did not have the fastidious appearance of the original shirt. It was worn throughout the fifteen launderings without touch-up pressing.

Fabric wrinkling was more evident in the shirts washed by machine. These in-service shirts required pressing after every laundering for satisfactory appearance.

TABLE II
Source of dissatisfaction on shirts*
(Five-member panel)

	Source of dissatisfaction				
Laundry method	*Wrinkled collar*	*Puckered seams*	*Wrinkled cuffs*	*Puckered pocket*	*Overall wrinkling*
Hand—105°F Drip dry	7	36	24	50	19
Machine—105°F Tumble dry	50	57	64	69	90
Machine—140°F Tumble dry	60	60	69	71	88
Machine—140°F Tumble dry**	50	52	93	67	90
Combined average	42	51	63	64	72

*Percent of total number of times each source of dissatisfaction was mentioned.
**Garments with straps were included in this laundry load.

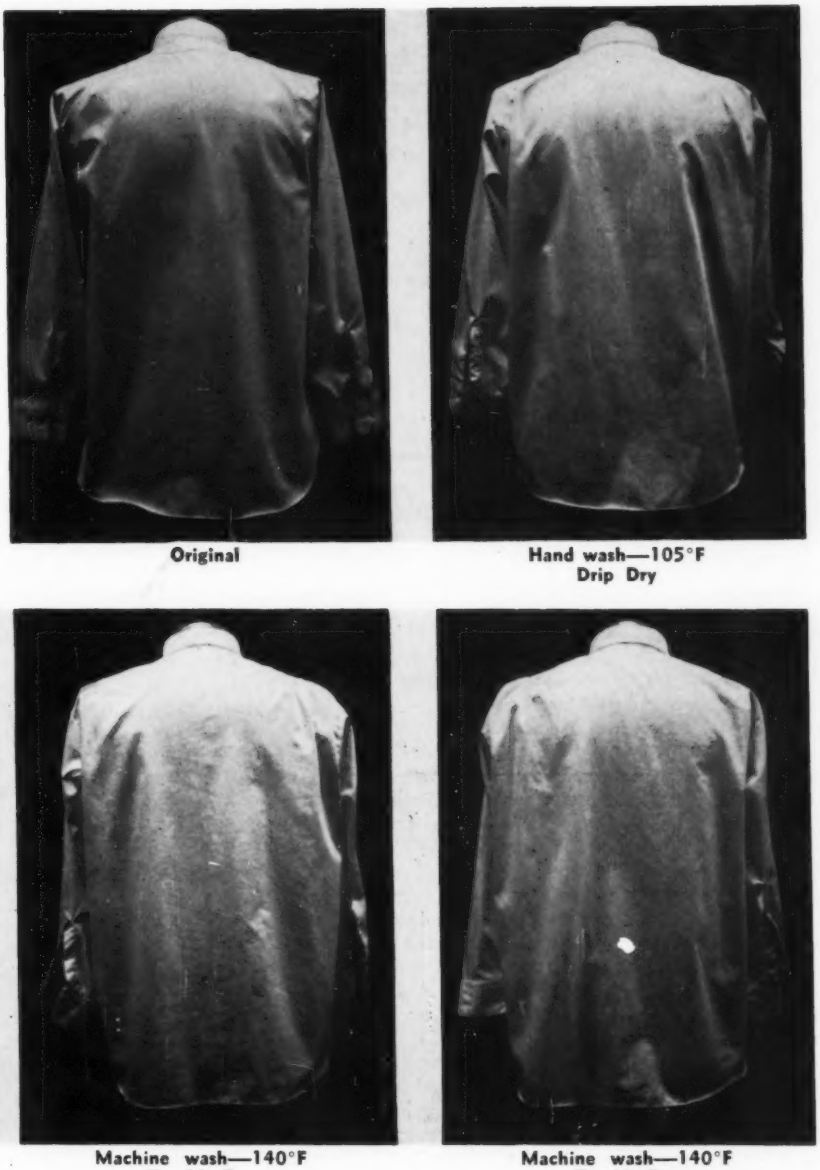


Figure 3
Back view of "wash-and-wear" cotton shirts showing varying degrees of wrinkling after fifteen launderings, placed in a descending order of panel ratings

All of the treated shirts showed signs of puckering at the seams, buttonholes, and pocket. The collars and cuffs of the hand-washed shirts were seldom wrinkled; those of the machine-washed shirts were often wrinkled and creased.

Consumer Satisfaction. The panel registered more satisfaction with the "wash-and-wear" shirts for casual wear than for dress wear. Hand-washed shirts were considered satisfactory for casual wear 90 percent of the time as compared with 43 to 40 percent for the machine-washed shirts. The hand-washed shirts were considered satisfactory for dress wear 57 percent of the time as compared with five to zero percent for the shirts washed by machine.

Panel members were asked to check the area of dissatisfaction, if any, for each shirt. Table II presents the panel results in percent of times each source was mentioned.

Examination of the figures of the combined averages indicated that the major source of dissatisfaction was the overall wrinkling of the shirt fabric. The collar was checked fewer times as a source of dissatisfaction than any other area. Listed in order of the most satisfactory to the least satisfactory, the areas of the shirts were: wrinkled collar, puckered seams, wrinkled cuffs, puckered pocket, and overall wrinkling.

FABRIC SQUARES———Wrinkling of fabric squares was evaluated by AATCC Tentative Test Method 88-1958 (Cranston Box technique) and by the photographic technique. The squares hand washed at 105°F, drip dried were consistently rated the highest by both techniques. Squares machine washed at 105°F, drip dried, one-half the standard load were rated next best. Squares machine washed at 140°F, tumble dried and squares machine washed at 140°F, tumble dried, garments with straps included were consistently rated the lowest. Squares laundered by other methods did not follow a definite sequence by all evaluation techniques, as shown in Table III.

TABLE III

Panel ratings of "wash-and-wear" fabric squares by two evaluation techniques

Laundry method	Rank of ratings	Combined average ratings — Panel of five — Tentative test	Panel of five — Photographic	Panel of 50 — Photographic
Original		5.0	5.0	5.0
Hand—105°F Drip dry	Highest	4.9	4.0	4.4
Machine—105°F Tumble dry		3.7	2.6	2.7
Machine—140°F Tumble dry		3.3	2.3	2.4
	Lowest			
Machine—140°F Tumble dry*		3.2	2.4	2.6
Machine—105°F Drip dry		3.5	2.9	2.9
Machine—140°F Drip dry		3.5	2.6	2.8
Machine—105°F Drip dry One-half standard load	Second highest	4.1	2.9	3.4

*Garments with straps were included in this laundry load.

Description of Wrinkling. The wrinkling of the fabric squares after the fifteenth laundering is shown in Figure 4. The polaroid photographs were taken using the Cranston Box to illuminate the fabric at a low angle, accentuating the wrinkles.

The original fabric represented ideal appearance. Fabric hand washed at 105°F, drip dried showed the incidence of some rippling and a few slight creases, but no sharp creases or wrinkles. It was rated the best by all evaluation techniques as regards wrinkling.

Rippling was more intense and intersecting creases more evident in fabric machine washed at 105°F, tumble dried. A different configurational pattern with a myriad of small, sharp, intersecting creases was evident in fabric machine washed at 140°F, tumble dried and fabric machine washed at 140°F, tumble dried, garments with straps included.

The remaining three fabrics were machine washed, drip dried, presenting still another pattern of wrinkling. Creases in fabric machine washed at 105°F, drip dried and in fabric machine washed at 140°F, drip dried were large and definite, but not as sharp and numerous as those in fabrics machine washed at 140°F, tumble dried with and without garments with straps included. The appearance of fabric machine washed at 105°F, drip dried, one-half the standard load may be described as showing rippling and a few slight creases. This fabric was rated second best to the fabric hand washed at 105°F, drip dried.

Wrinkle-Recovery Angle. The wrinkle-recovery angles of the treated fabrics, warp plus filling, were consistently lower than the original of 283 degrees, except one which was one degree higher.[2] The wrinkle-recovery angles of fabrics laundered by all methods met the suggested minimum standards of 230 degrees for wrinkle-resistant finishes.

COMPARISON OF SHIRTS AND FABRIC SQUARES——Most test methods for evaluating "wash-and-wear" performance describe the use of fabric samples. Some authorities have questioned the validity of using test fabric performance as a prediction of garment performance. Construction features of a garment are believed to influence the appearance to an extent that the evaluation of fabric squares only is unrealistic.

In this study, sets of fifteen-inch squares of "wash-and-wear" fabric accompanied the "wash-and-wear" shirts in four laundry methods. Shirts and fabric squares were evaluated by two techniques which were used for comparative purposes: by Cranston Box illumination and by the photographic technique.

By both techniques of evaluation the shirts and fabric squares followed the same sequence of ratings from best to worst, with one exception[3]. The panel tended to rate the fabric squares slightly higher than the shirts by the Cranston Box technique and the shirts higher than the fabric squares by the photographic technique.

[2]Fabric machine washed at 105°F, drip dried.

SUMMARY

In this study, white resin-treated cotton shirts and fabric squares were laundered by four methods and other fabric squares by three additional methods. The wrinkling of the fabric was evaluated after the first, the fifth, the tenth, and the fifteenth (final) launderings. Three techniques were used to evaluate the shirts; namely, ceiling illumination, the AATCC Tentative Test Method 88-1958, and a photographic technique. The latter two were used to evaluate the wrinkling of the fabric squares.

The combination of hand washing at 105°F and drip drying produced fewer wrinkles in "wash-and-wear" cotton shirts than the machine laundering methods. On a rating scale of "5" (quite smooth) to "1" (very wrinkled) the combined average ratings for the hand-washed shirts ranged from 4.6 by the tentative standard technique of evaluation (Cranston Box) to 4.3 by the ceiling illumination and photographic techniques. These ratings were considerably higher than the combined average ratings for the machine-washed shirts, which were rated from 3.6 by the tentative standard technique to 2.5 by ceiling illumination.

The combined average ratings of the shirts by all evaluation techniques consistently followed a pattern in order of ratings. This pattern was (listing the best first) 1) hand washed at 105°F, drip dried; 2) machine washed at 105°F, tumble dried; 3) machine washed at 140°F; tumble dried; and 4) machine washed at 140°F, tumble dried, with the inclusion of garments with straps in the laundry load.

When water temperature was the only variable, combined ratings were consistently higher for shirts and fabric squares laundered at 105°F than for those laundered at 140°F.

Combined average ratings for the fabric squares which were laundered with the test shirts followed the same sequence as the shirts by the tentative standard (Cranston Box) technique of evaluation. When evaluated by means of the photographs, the fabric squares followed a similar sequence as the shirts, except that the fabrics which were machine washed at 140°F and tumble dried using the regular load were rated slightly lower than those laundered by the method including garments with straps in the laundry load.

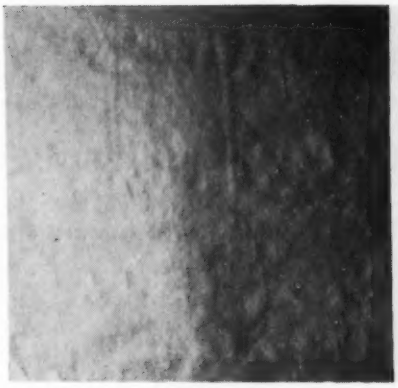
When combined average ratings for the sets of fabric squares laundered by the seven methods were studied, the fabric squares which were machine washed at 105° with one-half the standard load and drip dried were rated second best to the hand-washed squares. The two methods which produced the lowest ratings consistently were the machine washed at 140°F, tumble dry and the machine washed at 140°F, tumble dry, garments with straps included in the load. Other methods did not follow a definite pattern by all techniques of evaluation.

[3]Both the panel of five and the panel of fifty evaluated the fabric squares machine washed at 140°F, tumble dried, garments with straps included slightly higher than squares machine washed at 140°F, tumble dried.

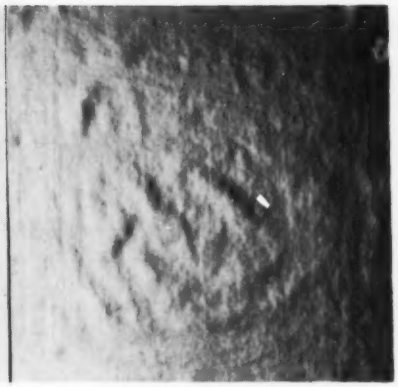
Figure 4

"Wash-and-wear" fabric squares showing varying degrees of wrinkling and panel ratings after fifteen launderings.

"CB" designates the rating by Cranston Box illumination. "P" designates the rating by photographs, panels of five and fifty.

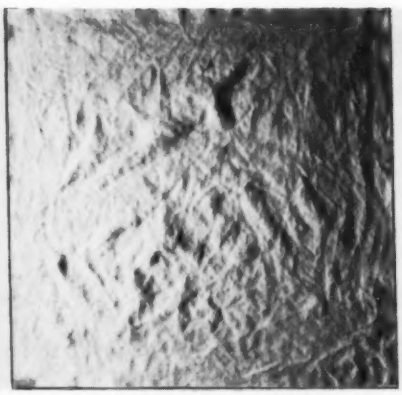


Original
CB—5.0
P—5.0

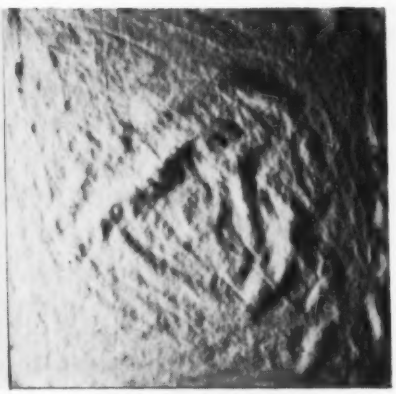


Hand wash—105°F
Drip dry
CB—4.9
P—4.0 & 4.4

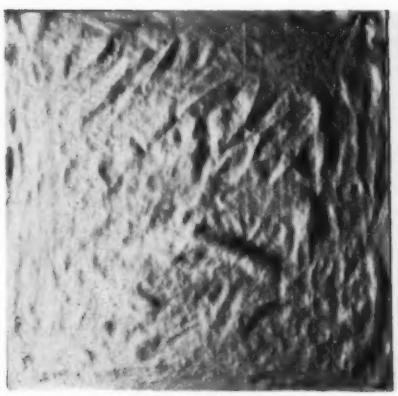
Machine wash—105°F
Tumble Dry
CB—3.7
P—2.6 & 2.7



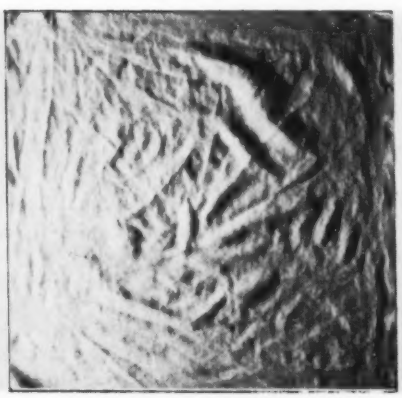
Machine wash—140°F
Tumble Dry
CB—3.3
P—2.3 & 2.4



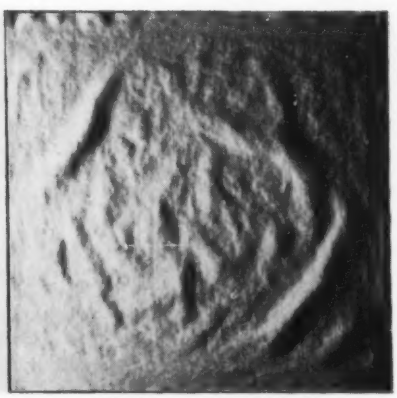
Machine wash—140°F
Tumble dry, garments with straps
CB—3.2
P—2.4 & 2.6



Machine wash—105°F
Drip dry
CB—3.5
P—2.9 & 2.9



Machine wash—140°F
Drip dry
CB—3.5
P—2.6 & 2.8



Machine wash—105°F
Drip dry, one-half standard load
CB-4.1
P—2.9 & 3.4

The ratings of shirts and fabric squares were consistently higher by the Cranston Box than by the photographic or the ceiling illumination techniques. The latter technique, which was used for shirts only, produced the lowest panel ratings.

The wrinkle-recovery angle of fabrics laundered by the methods in this study met the suggested standards of 230 degrees for crease-resistant finishes. After fifteen launderings the wrinkle-recovery angles of treated fabrics, warp plus filling, were slightly lower than that of the original, with the exception of fabric machine washed at 105°F, drip dry, which was approximately the same as the original.

(*concluded on page 62*)

CHANGES IN THE PROPERTIES OF PARTIALLY PHOSPHONOMETHYLATED COTTON CAUSED BY CROSSLINKING PRIOR TO PHOSPHONOMETHYLATION

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Crosslinking the cellulose of cotton fabrics with dichloropropanol prior to phosphonomethylation with disodium chloromethyl phosphonate made possible a higher degree of substitution without loss of fabric structure. Crosslinked cotton print cloth and sheeting were phosphonomethylated (both once and twice). The DS increases over noncrosslinked phosphonomethylated fabrics were approximately 25 and 50%, respectively. Flame resistance, cation exchange capacity, resistance to microbiological degradation, and moisture content increased approximately in proportion to the increase in DS. Furthermore, prior crosslinking produced fabrics with significantly less stiffness, and nearly normal air-permeability. Pilot-plant equipment was used for all of the treatments.

INTRODUCTION

THE reaction of chloromethylphosphonic acid with cotton cellulose and the properties imparted to fabrics by this reaction have been described recently (*3,5*). A very stable derivative is formed by the reaction which may be represented as follows:

$$\text{Cell OH} + \text{ClCH}_2\text{P(O)(OH)}_2 + 3\ \text{NaOH} \longrightarrow \text{Cell OCH}_2\text{P(O)(ONa)}_2 + \text{NaCl} + 3\text{H}_2\text{O}.$$

Phosphonomethylation tends to make cotton water-soluble, especially at higher degrees of substitution, but prior crosslinking reduces the tendency of cotton to dissolve. Therefore, by crosslinking first, attainment of high degrees of phosphonomethylation is possible without destroying the fabric properties.

A mixture of 1,3-dichloropropanol-2 and 2,3-dichloropropanol-1, reagents used at this Laboratory previously (*10*), was used as the crosslinking agent in the present investigation. The use of these compounds is also mentioned in recent patents (*2,4*). A reaction for crosslinking cellulose with this mixture may be represented as follows:

$$2\text{Cell OH} + \text{ClCH}_2\text{CH(OH)CH}_2\text{Cl} + 2\text{NaOH} \longrightarrow \text{Cell OCH}_2\text{CH(OH)CH}_2\text{O Cell} + 2\text{NaCl} + 2\text{H}_2\text{O}.$$

The degree of crosslinking is possibly quite small but is nevertheless sufficient to prevent solubility in cuprammonium hydroxide, a reagent for indicating crosslinking of chemically modified cotton cellulose (*10*). The crosslinked products were subsequently phosphonomethylated.

The products were similar to those obtained by phosphonomethylation only. However, greater flame resistance (ammonium salt form) in all but one case and greater cation exchange capacity resulted because of the increased phosphorous content. Stiffness, and the slick feeling when wet (sodium salt form), were considerably reduced by prior crosslinking.

[1]One of the laboratories of the Southern Utilization Research and Development Division, Agricultural Research Service, U S Department of Agriculture.

EXPERIMENTAL

MATERIALS AND METHODS——The base fabrics used were standard types 4.8 oz/sq yd 48 × 48 cotton sheeting and 3.3 oz/sq yd 80 × 80 cotton print cloth which had been desized, scoured, and peroxide-bleached.

The dichloropropanol was a commercial-grade material consisting of a mixture of approximately 70% 2,3-dichloropropanol-1 and 30% 1,3-dichloropropanol-2. The chloromethylphosphonic acid and sodium hydroxide were also commercial-grade materials.

Two solutions were prepared for the crosslinking treatment. One was a 10% (wt/wt) solution of dichloropropanol in water and the other was a 37.5% (wt/wt) solution of sodium hydroxide in water.

The phosphonomethylation solution was prepared by mixing with cooling, two solutions, A and B. Solution A consisted of 35% (wt/wt) sodium hydroxide in water. Solution B was made by carefully neutralizing a 28.7% (wt/wt) solution of chloromethylphosphonic acid in water with a 28.6% (wt/wt) solution of sodium hydroxide in water. Keeping the temperature below 20°C, 46.45 lb of solution A were added slowly to 18.5 lb of solution B. The final solution composition was 6.8% disodium salt of chloromethylphosphonic acid and 25% sodium hydroxide. For the single phosphonomethylation, fabric was padded through the solution immediately to minimize the possibility of removal of the chlorine atom by hydrolysis prior to use, although the chlorine has been considered to be relativetly unreactive (*7,14*). Commercial-scale equipment was used for processing the fabric.

The textile tests were performed on specimens in equilibrium with the standard atmosphere 21°C and 65% relative humidity. Standard methods were employed for the following tests: wrinkle recovery angle by the Monsanto method (*1a*); tearing strength by the Elmendorf (*1b*) and tongue (*1c*) methods; breaking strength and elongation-at-break on strips raveled to original thread count, weight, thickness, and yarns per inch (*1c*); flex abrasion resistance by the Stoll method (*1d*); air permeability using the Permeometer at a

TABLE I

Fabric width changes during processing of crosslinked and phosphonomethylated fabrics

Fabric being treated	Treatment	Fabric widths, in: 80 × 80 print cloth — Before treatment	80 × 80 print cloth — After treatment — washed	80 × 80 print cloth — After treatment — dried	48 × 48 sheeting — Before treatment	48 × 48 sheeting — After treatment — washed	48 × 48 sheeting — After treatment — dried
Untreated	Crosslinking	36¾	32¼	35	36¼	34½	36
Untreated	Phosphonomethylation	36¾	32	35	36¼	31¾	35
Untreated	25% NaOH	36¾	31	35	36¼	32	35
Crosslinked	Phosphonomethylation	35	32½	35	36	32	35

pressure drop of 0.5 in of water (*1e*); soil burial (*1f*); and stiffness using the Tinius Olsen stiffness tester (*13a*). Wet wrinkle recovery was measured by the method of Lawrence and Phillips (*8*), using blotting paper to remove excess moisture instead of layers of cloth. Flame retardancy was measured, both by the standard vertical test (*13b*) and by the strip test method (*5, 11*). Weather exposure tests were conducted in New Orleans, Louisiana, in an unshaded location, with the samples exposed on open-backed wooden racks facing south at an angle of 45° from the vertical and at a minimum distance of 30 in above the ground.

Phosphorus content was determined by the colorimetric reduced molybdate method after digestion with sulfuric acid and hydrogen peroxide (*9*).

Crosslinking was indicated by the cuprammonium insolubility method (*10*).

The samples were prepared for moisture equilibration from the dry state by drying in a forced draft oven at 110°C for 40 minutes. For equilibration from the wet state, the samples were soaked in distilled water overnight and passed through the laboratory pad rolls once at light pressure setting. These samples were then hung in a room conditioned at 65% relative humidity and 21°C and weighed periodically, so that the rate of moisture equilibration could be determined.

The maximum cation exchange capacities were determined by the method of Hoffpauir and Guthrie (*6*) omitting the addition of 1M sodium chloride and using only 1.5 hrs equilibration time.

TREATMENT OF FABRICS

Crosslinking. One hundred yards of 80 × 80 print cloth and 25 yards of 48 × 48 sheeting were padded through the dichloropropanol solution twice to obtain a wet pickup of 105%. The fabrics were then padded once through the 37.5% sodium hydroxide solution to obtain a total wet pickup of 126%. Although warming of the impregnated fabric roll indicated immediate reaction, an extra 10 minutes were allowed for more complete reaction before washing.

The washing on the jig consisted of four ends cold running tap water at a pH of approximately 10, four ends hot tap water (77°C), one end cold running tap water, two ends souring in 0.5% acetic acid, two ends in hot tap water, and two ends in cold running tap water. The wet fabric was passed through squeeze rolls, using maximum pressure to remove excess water, and dried on a tenter frame.

Phosphonomethylation. One hundred yards of untreated 80 × 80 print cloth, 25 yards of untreated 48 × 48 sheeting, 25 yards of crosslinked 80 × 80 print cloth, and five yards of crosslinked 48 × 48 sheeting were combined in one roll and phosphonomethylated. The roll was padded twice through the phosphonomethylation solution to obtain a total wet pickup of 139%. The reaction was accelerated by heating on drying cans which were held at 125°C using 13 minutes to traverse the range and the fabrics were then washed on the jig. The wash consisted of six ends cold running tap water at a pH of approximately 10 and six ends hot tap water (77°C); the pH of the water from the final wash was then the same as that of the tap water. The wet fabric was passed through squeeze rolls, using maximum pressure to remove excess water. This was followed by drying on a tenter frame.

Twenty-two yards of half-width phosphonomethylated print cloth, 4.5 yards of half-width phophonomethylated sheeting, 4.5 yards of half-width crosslinked and phosphonomethylated print cloth, and 3.5 yards of half-width crosslinked and phosphonomethylated sheeting were combined into one roll. They were treated a second time with the same phosphonomethylation solution, which had aged overnight at 7°C, by padding twice, using the laboratory pad rolls, obtaining a wet pickup sufficient for the solution to be dripping from the fabric roll. They were then passed over drying cans at 125°C for 13 minutes as above and washed on a winch. The washing consisted of four five-minute cold-water washes, two ten-minute hot-water (77°C) washes and an additional cold-water wash. Excess water was removed by squeezing with the pad rolls and the fabrics were dried on the tenter frame.

After washing, the twice-phosphonomethylated fabrics were highly swollen and very slick, especially those which had not been crosslinked, making them difficult to maneuver on the tenter frame. The drying was very slow, particularly for the sheeting which had not been previously crosslinked.

Control fabrics. For comparative purposes, sodium hydroxide control fabrics were also prepared. One hundred yards of 80 × 80 print cloth and 30 yards of 48 × 48 sheeting were padded twice through 25% sodium hydroxide, obtaining a total wet pickup of 135%. They were dried on the cans at 125°C for 13 minutes. The fabrics were washed, soured, and dried in the same manner as were the crosslinked fabrics.

The data on fabric width changes during processing are shown in Table I. All of the fabrics were drawn out to their final widths during the drying on the tenter frame. Data are not included for the doubly phosphonomethylated fabrics because the treatments were with half-width fabric.

Conversion to acid and various salt forms. The phosphonomethylated fabrics obtained were largely in the sodium salt forms. Samples were converted to the diammonium and copper salt forms by way of the free acid form. The acid forms were made by soaking the fabrics in 5% hydrochloric acid for one hour and then soaking in several changes of distilled water for a total of two hours to remove the greater portion of the excess hydrochloric acid. The ammonium salts were made by soaking the acid form in 5% ammonium hydroxide solution for one hour, rinsing in distilled water and air-drying. The copper salts were made by soaking the acid form in 5% copper acetate solution for one hour,

TABLE II
Extent of phosphonomethylation of crosslinked and phosphonomethylated cotton

Fabric treatment	80 × 80 print cloth		48 × 48 sheeting	
	Phosphorous content sodium salt, %	Degree of substitution	Phosphorus content sodium salt, %	Degree of substitution
Singly phosphonomethylated	0.72	0.04	0.95	0.05
Crosslinked, singly phosphonomethylated	0.92	0.05	1.46	0.08
Doubly phosphonomethylated	1.66	0.09	1.83	0.10
Crosslinked, doubly phosphonomethylated	1.93	0.11	2.47	0.15

TABLE III
Textile properties of crosslinked and phosphonomethylated 80 x 80 cotton print cloth

Property		Untreated	25% NaOH control	Cross-linked	Phosphono-methylated	Crosslinked phosphono-methylated	Doubly phosphono-methylated	Crosslinked doubly phosphono-methylated
Thread count	W	83	89	88	87	88	96	97
	F	77	77	77	79	82	85	86
Breaking strength, strip, lb	W	47.5	46.3	41.3	50.3	46.1	52.5	51.1
	F	37.8	36.0	26.9	39.8	31.1	31.9	38.0
Elongation at break, %	W	9.4	9.5	7.6	12.5	13.3	19.4	18.1
	F	17.7	22.2	21.7	22.3	21.3	27.9	33.7
Tearing strength, Elmendorf, g	W	1256	1360	1176	1224	1102	872	1072
	F	968	956	728	796	804	472	596
Tearing strength, Tongue, lb	W	4.1	4.4	3.2	4.4	3.6	3.3	3.4
	F	4.2	4.0	2.9	3.8	3.3	2.0	2.4
Wrinkle recovery, deg Dry	W	77	92	86	66	85	49	73
	F	84	85	87	74	96	58	81
Wet	W	69	121	137	101	92	102	101
	F	86	119	129	108	104	—	—
Abrasion resistance, flex, cycles	W	1735	1451	1274	1458	1172	679	1005
	F	1540	1066	734	1172	929	390	643
Stiffness, bending moment X 10^{-4}, in −lb	W	4.8	5.5	7.4	37.4	10.8	154.5	60.4
	F	2.2	2.3	2.0	9.3	6.7	38.1	29.4
Weight, oz/yd²		3.29	3.62	3.49	3.79	4.08	4.40	4.96
Thickness, in		0.0073	0.0077	0.0075	0.0080	0.0088	0.0090	0.0120
Air permeability, ft³/min/ft²		88	123	134	105	100	12	70

TABLE IV
Textile properties of crosslinked and phosphonomethylated 48 x 48 cotton sheeting

Property		Untreated	25% NaOH control	Cross-linked	Phosphono-methylated	Crosslinked phosphono-methylated	Doubly phosphono-methylated	Crosslinked doubly phosphono-methylated
Thread count	W	54	53	52	54	54	60	61
	F	46	48	45	49	50	52	53
Breaking strength, strip, lb	W	69.2	70.5	59.8	73.1	71.8	64.8	69.7
	F	41.9	45.1	37.0	39.8	36.1	22.1	32.0
Elongation at break, %	W	9.3	11.1	7.6	16.9	15.9	16.5	19.4
	F	23.2	22.8	23.1	25.1	23.8	24.7	35.0
Tearing strength, Elmendorf, g	W	2010	1830	1400	1770	1620	928	920
	F	1100	1130	850	850	900	376	640
Tearing strength, Tongue, lb	W	5.2	5.7	3.3	5.3	5.0	3.8	4.2
	F	4.1	4.6	4.3	3.6	3.4	1.8	2.7
Wrinkle recovery, deg Dry	W	85	60	77	24	42	26	<40
	F	86	79	83	36	53	20	<50
Wet	W	82	92	121	88	76	—	—
	F	98	104	119	113	93	—	—
Abrasion resistance, flex, cycles	W	578	559	582	721	518	667	426
	F	410	572	494	728	403	834	392
Stiffness, bending moment X 10^{-4}, in −lb	W	11.3	108.0	38.2	432.0	276	615.0	454.1
	F	2.6	20.4	5.4	107.2	68	311.6	191.9
Weight, oz/yd²		4.78	5.04	484	5.53	6.23	5.84	7.66
Thickness, in		0.0112	0.0113	0.0115	0.0126	0.0143	0.0138	0.0187
Air permeability, ft³/min/ft²		73	199	117	127	183	37	132

soaking in three changes of distilled water for a total of one hour, followed by air-drying. Conversion to the copper salts imparted a light blue color to the fabrics.

PROPERTIES——The data on the controls and noncrosslinked fabrics are the subject of an earlier paper (5), but are included here for comparison. The phosphorus contents and degrees of substitution of 80 × 80 print cloth and 48 × 48 sheeting which were singly and doubly phosphonomethylated both with and without prior crosslinking are shown in Table II. Phosphorus contents were substantially greater for the fabrics which had been crosslinked prior to phosphonomethylation.

The fabric properties of the treated and control fabrics are shown for the 80 × 80 print cloth in Table III and the 48 × 48 sheeting in Table IV. Excessive increases in fabric stiffness were observed on phosphonomethylation (singly and doubly) alone, but prior crosslinking reduced these increases by approximately one half for 80 × 80 print cloth and one third for 48 × 48 sheeting, even though the degrees of phosphonomethylation were higher. Double phosphonomethylation alone caused reduction in air-permeability probably due to

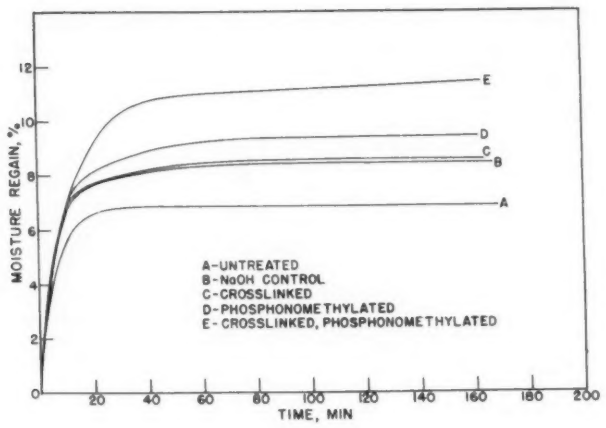

Figure 1

Rate of moisture regain from the dry state by crosslinked and phosphonomethylated 80 x 80 cotton print cloth

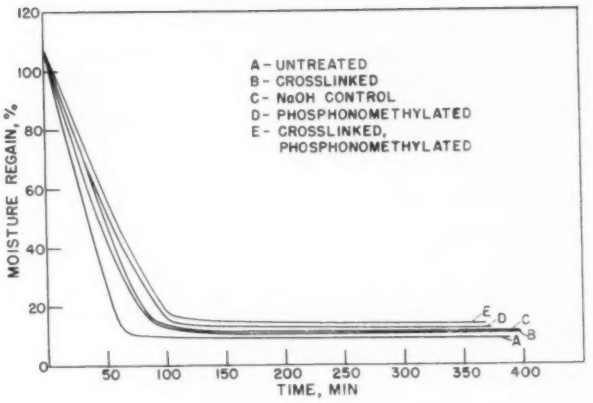

Figure 2

Rate of moisture equilibration from the wet state for crosslinked and phosphonomethylated 80 x 80 cotton print cloth

TABLE V
Flame retardancy of crosslinked and phosphonomethylated cotton fabrics

	Description	Phosphorus content[1], %	Flame retardancy[2] — Standard vertical char length, in	Flame retardancy[2] — Strip angle, deg
80 × 80 print cloth	Phosphonomethylated	0.72	BEL[3]	90
	Crosslinked, phosphonomethylated	0.92	BEL[3]	90
	Doubly phosphonomethylated	1.66	4.0	135
	Crosslinked, doubly phosphonomethylated	1.93	3.8	160
48 × 48 sheeting	Phosphonomethylated	0.95	BEL[3]	145
	Crosslinked, phosphonomethylated	1.46	3.9	140
	Doubly phosphonomethylated	1.83	3.2	160
	Crosslinked, doubly phosphonomethylated	2.47	3.1	180

[1]Fabrics in sodium salt form.
[2]All fabrics in ammonium salt form when tested.
[3]Burned entire length.

TABLE VI
Stability of phosphonomethylated 80 x 80 print cloth to alkaline boil

Treatment	Phosphorus content, % — Before boil	After three-hour boil in — Water	2% NaOH	Standard soap and soda
Phosphonomethylated	0.72	0.78	0.76	0.77
Crosslinked, phosphonomethylated	0.92	1.02	1.00	1.03

TABLE VII
Effect of soil burial on the breaking strengths of the copper salts of crosslinked and phosphonomethylated 80 x 80 cotton print cloths

Fabric	Breaking strength, strip, W, lb[1] — Weeks of burial: DS	0	1	3	4	8
Phosphonomethylated	0.04	49.8	45.6	8.1	1.8	0
Crosslinked, phosphonomethylated	.05	46.8	44.8	21.5	9.2	0
Doubly phosphonomethylated	.09	46.2	47.5[2]	—	33.4[2]	2.4[3]
Crosslinked, doubly phosphonomethylated	.11	48.8	50.3[2]	—	25.9[2]	13.9[3]

[1]For the same thread count as the untreated.
[2]Only two breaks.
[3]Only one break.

fiber-to-fiber bonding. However, prior crosslinking nearly eliminated this reduction for 80 × 80 print cloth and completely eliminated it for 48 × 48 sheeting. Prior crosslinking slightly reduced tearing strength losses (Elmendorf and tongue) resulting from double phosphonomethylation. The wet wrinkle resistance of 80 × 80 print cloth was increased approximately 50° (W+F) by a single phosphonomethylation, but was not further increased by a second phosphonomethylation, nor by prior crosslinking. It is interesting to note that the sodium hydroxide control had an 85° (W+F) increase in wet wrinkle recovery for this fabric. Crosslinking with dichloropropanol increased the wet wrinkle resistance 111° (W+F) as could be expected from previous work with this compound. Increases in wet wrinkle recovery due to phosphonomethylation with or without crosslinking for 48 × 48 sheeting were insignificant. The only substantial increase in this property for this fabric was 60° (W+F) due to crosslinking alone. The thicknesses of the fabrics which were crosslinked prior to single and double phosphonomethylation were appreciably greater than the respective fabrics which were not crosslinked, probably because of the added phosphonomethyl groups and the tendency of the crosslinks to hold the fabric in a swollen condition.

The flame retardancies of crosslinked and phosphonomethylated fabrics are shown in Table V. As expected, crosslinking prior to phosphonomethylation permits introduction of more phosphorus and consequently a higher degree of flame resistance for the ammonium salt form.

The permanence to alkaline boil of the the phosphorus introduced by phosphonomethylation, with or without prior crosslinking, is shown for 80 × 80 print cloth in Table VI. There was no loss in phosphorus content resulting from three hours boiling in either water, 2% sodium hydroxide, or standard soap (*12*) and soda solution (0.5% standard soap and 0.2% sodium carbonate).

Moisture equilibration rates for the metal salt forms of crosslinked and phosphonomethylated 80 × 80 print cloths from the dry and wet states are shown in Figures 1 and 2, respectively. The initial rate of moisture regain from the dry state is the same for all the fabrics, but higher final moisture regains are attained by the phosphonomethylated and the crosslinked-phosphonomethylated fabrics. The latter fabric, having a higher

TABLE VIII

Cation exchange capacities of crosslinked and phosphonomethylated 80 x 80 print cloth

Treatment	Phorphorus content[1], %	Cation exchange capacity, meq/g — Found	Cation exchange capacity, meq/g — Calculated[2]
Untreated	0	0.18	0
Phosphonomethylated	0.72	0.70	0.46
Crosslinked, phosphonomethylated	0.92	0.81	0.59
Doubly phosphonomethylated	1.66	1.16	1.07
Crosslinked, doubly phosphonomethylated	1.93	1.57	1.24

[1]In sodium salt form.
[2]Calculated from the phosphorus content.

degree of substitution of the highly hydrophilic phosphonomethyl group, takes up the greatest amount of moisture. From the wet state the untreated fabric equilibrates most rapidly. Again a higher final moisture regain is observed for the hydrophilic crosslinked and phosphonomethylated fabric. Both of the equilibration curves for the crosslinked fabric are very nearly identical to the respective NaOH control curves, probably due to the similar degree of swelling in their treatments.

Soil burial tests on the copper salt forms of both singly and doubly phosphonomethylated 80 × 80 cotton print cloth with and without prior crosslinking have been conducted. As shown in Table VII, the degree of rot resistance appears to be roughly proportional to the amount of copper present as indicated by DS. Crosslinked and doubly phosphonomethylated fabric, having the greatest number of phosphonomethyl groups and therefore the most copper, had nearly 30% of its original strength after eight weeks of soil burial.

Weatherability of cotton was lowered by phosphonomethylation. Outdoor exposures were conducted on the 80 × 80 print cloth controls, crosslinked fabric, and the sodium and ammonium salt forms of singly phosphonomethylated fabric both with and without prior crosslinking. At the end of 10 months, the breaking strengths of all of the fabrics containing the phosphomethyl group were within the nine to 14% range based on their individual strengths prior to weathering. Also at the end of this time the untreated, NaOH control, and crosslinked fabrics had 24, 35, and 46% of their original strengths, respectively.

The cation exchange capacities of crosslinked and phosphonomethylated 80 × 80 print cloth are shown in Table VIII. Substantial increases were made in the capacities of the phosphonomethylated fabrics by prior crosslinking. Addition of the capacity of the untreated fabric to the calculated values for the treated fabrics brings them nearly in line with those actually found. Higher cation exchange capacities can be obtained by modifying conditions of treatment.

SUMMARY

The effects on the fabric properties of crosslinking cotton fabrics prior of phosphonomethylation have been studied. Higher substitution may be obtained because the crosslinked cellulose chains stabilize the fabric structure by reducing excessive swelling and tendency toward solution associated with phosphonomethylation. Higher degrees of flame resistance, cation exchange, moisture regain, and resistance to microbiological deterioration of the copper salts are obtained in this way. In addition, the high increases in stiffness observed on phosphonomethylation alone are reduced substantially by prior crosslinking.

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FUTURE PAPERS

The following specially contributed articles have been accepted for publication in American Dyestuff Reporter during 1961:

"Politics, Phoenix and Paterson"———Textile Processing in New Jersey"———Sidney M Edelstein, Dexter Chemical Corp

"Application of the APO-THPC Flame Retardant to Cotton Fabric"———George L Drake Jr, John V Beninate and John D Guthrie, Southern Regional Research Laboratory

"Consumer Complaints: A Source of Information for Producers"———Samuel L Myers, Morgan State College

"Studies of Wrinkle Resistance Finishes for Cotton Textiles: III. An Accelerated Storage Test for 'Wash-and-Wear' Cotton Fabrics"———Richard L Arceneaux, Gloria A Gautreaux, Robert M Reinhardt, and J David Reid, Southern Regional Research Laboratory

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1960 National Convention———

REDUCING THE FELTING SHRINKAGE OF WOOL*

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The chemistry and mechanics of wool feltproofing processes are discussed. In addition details of the application for this purpose of a new acrylic polymer are presented.

INTRODUCTION

IF cotton is the king of fibers, wool should be the queen of the realm. This fiber is revered for its texture, resilience, warmth, absorbency, durability, wrinkle resistance, flame resistance and dyeing properties. The resins which are claimed to impart a "wooly" hand to rayon, and the synthetic fibers which are claimed to be like wool in their properties, attest to the stature of this natural fiber. If only wool were washable!

In many respects wool *is* washable. It has the strength to resist the mechanical action of the washer. Chemically it is not affected by many detergent systems. The primary reason that wool is not regarded as washable is the tendency of the fabrics made of this fiber to shrink.

TYPES OF SHRINKAGE

The shrinkage which takes place when untreated woolen fabric is laundered can be divided into three parts—relaxation shrinkage, felting shrinkage and consolidation shrinkage.

During the spinning, weaving, dyeing, and other operations which are part of the production process, the wool is drawn, stretched, pulled, and in other ways subjected to tensile forces. Unless special precautions are taken, this stretch may be retained by the fabric as a type of temporary set. When such a fabric is soaked in water or perhaps only steamed, pressed, or sponged, latent strains are released and the fibers regain their unstretched length. The extent of this relaxation shrinkage rests in the hands of those who control the mechanical processes to which wool is subjected. London Shrinking and steaming operations, such as decating, are the traditional methods for reducing relaxation shrinkage.

The surface of the roughly cylindrical wool fiber is covered by a sheath of overlapping scales, much like the shingles on a roof. Because of this scaly structure, a greater force is required to move a fiber with the tip first than when the root leads the way. This characteristic is partially responsible for the tendency of wool to felt.

Speakman, Stott and Chang (*1*) designated the three fiber attributes necessary to produce felting as a) unique surface structure, b) ability to stretch, and c) power to recover from stretching. When a woolen fabric is subjected to repeated stresses, as in laundering, the elastic motions coupled with the differential friction effect cause the fibers to migrate rootward, carrying other fibers with which they have become entangled. With repeated mechanical action the wet wool fibers continue to become so entangled that they cannot be separated in a practical manner without considerable fiber damage. This is felting (*2*). Originally it was believed that the fibers moved because the scales acted like interlocking barbs, but now it appears that the directional friction properties of the fiber are sufficient to account for this phenomenon.

Manufacturing strains are not always completely removed in the standard hot water or steam relaxation treatments. In some instances a certain amount of mechanical action is necessary to speed the relaxation process. If the fabrics are not fully relaxed when they enter the laundering operation, they may shrink though no fiber migration or felting shrinkage occurs. This loss of area is known as consolidation shrinkage. Thus fabrics may be made unfeltable but not necessarily unshrinkable (*3*). Unshrinkability depends to a large extent on the structure of the fabric. Knitted fabrics are particularly susceptible to consolidation shrinkage.

TEST METHODS

The obvious way to evaluate the performance of feltproofing finishes is to launder the treated fabrics. But, as is indicated in Table I, the conditions which have been recommended for testing are quite diverse. In addition to those standard methods listed, the use of the Accelerotor for testing treated wool has been reported (*4*), and many workers employ home agitator-type washers of various manufacturers. In many laboratory evaluations, relaxation shrinkage is measured separately.

The factors which are important in an accelerated test method for evaluating the felting of wool are discussed by Weiner (*5*). He concluded that, in a horizontal washer, increasing the detergent concentration decreases the rate of felting shrinkage because of the cushioning action of the suds. In contrast, the felting of a completely submerged wash load, as in an agitator-type washer, is accelerated because of the lubricating action of the detergent. He also showed that shrinkage increased with decreasing pH, with increasing temperature, and with increasing time of agitation. Tumble drying caused considerably more shrinkage than oven drying.

Weiner also pointed out that a woolen ballast produces more shrink-

*Presented October 7, 1960 at the 1960 AATCC Convention held at the Sheration Hotel, Philadelphia, Pa.
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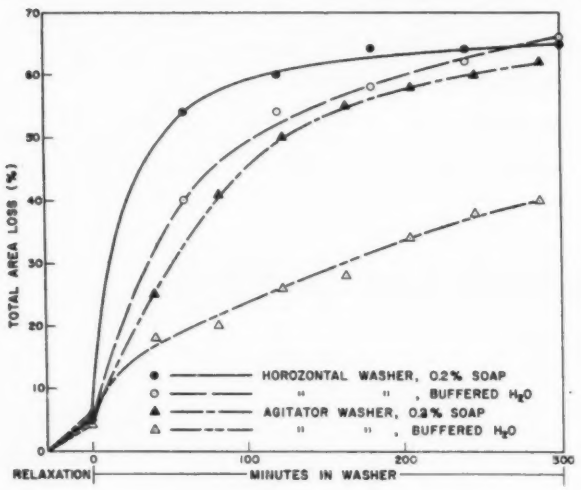

Figure 1
Effect of wash conditions on the shrinkage of untreated wool

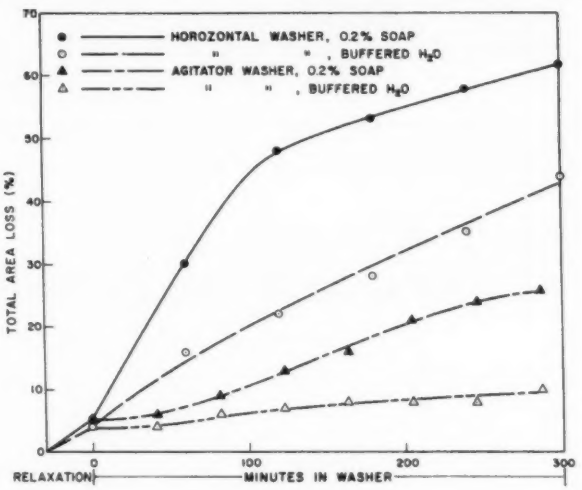

Figure 2
Effect of wash conditions on the shrinkage of inadequately treated wool

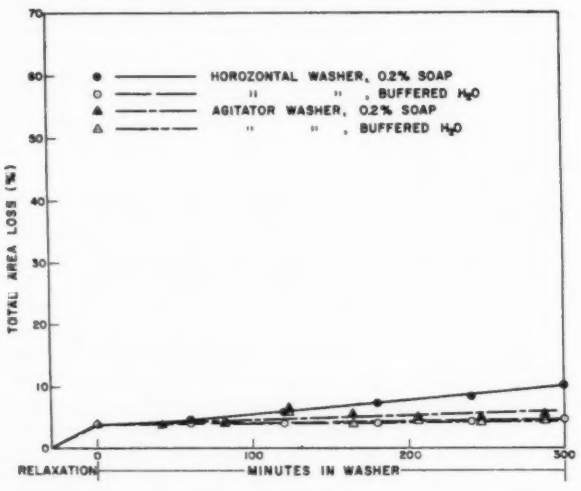

Figure 3
Effect of wash conditions on the shrinkage of felt-resistant wool

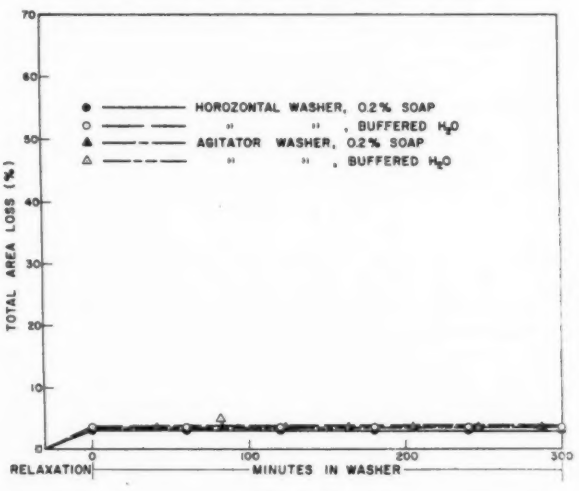

Figure 4
Effect of wash conditions on the shrinkage of feltproof wool

age than a cotton ballast of the same weight. It also has been suggested (6) that wool laundered in the presence of stabilized wool shrinks less than wool washed with untreated wool as ballast. The data in Table II supports the latter suggestion.

To evaluate the importance of test variables, a wool flannel was treated with an acrylic emulsion polymer to achieve varying degrees of stabilization. Portions of these samples then

TABLE I
Test methods for measuring the felting of wool

Organization	*Washer*	*Wash load (lbs)*	*Temp (°F)*	*Bath additives*	*Time of wash (min)*	*First rinse* Temp (°F)	*First rinse* Time (min)	*Second rinse* Temp (°F)	*Second rinse* Time (min)	*Centrifuge*	*Press*
Federal Specification CCC-T-191b, Test, Method 5554	Horizontal rotary reversing wheel	6	140	Buffer pH 7.0	60	—	—	—	—	5 min	tumble dry, then press
American Association of Textile Chemists and Colorists, #99-1960	Horizontal rotary reversing wheel	3	100	0.015% polyphosphate, 0.25% borax, soap sufficient for 1" suds	75	100	10	100	5	yes	yes
Cluett, Peabody & Co. Sanforlan	Horizontal	3	140	0.10% soap 0.17% borax 0.01% Calgon	40	140	5*	140	10	5 min	yes

* In 0.01% Calgon ($Na_6P_6O_{18}$)

TABLE II

Effect of ballast on the felting of wool

Untreated fabric	*% Area felting* (one AATCC #41-52 Wash)	
	100% Stabilized wool ballast	*50% Stabilized wool ballast plus 50% shrinkable wool ballast*
#1	11	19
#2	38	52
#3	35	48

TABLE III

Feltproofing processes

OXIDATION (based on halogens—particularly chlorine)
- Halogen gases
- Hyponalites, halites and halates
- N-Halo-compounds
- Chromyl chloride
- Nitrosyl chloride

OXIDATION (based on oxy-compounds)
- Permanganates
- Peroxides
- Per-acids and their salts
- Ozone

REDUCTION (generally followed by alkylation)
- Sulfites
- Thiols
- Disulfides
- Thiosulfates
- N-(Acylthiomethyl) amides
- Formamidine sulfinic acid

ALKALIS
- Metal hydroxides in dry solvents
- Dilute aqueous weak bases
- Quaternary ammonium bases

ENZYMES
- Papain
- Pepsin
- Pancreatin

FORMALDEHYDE RESINS
- Triazines (particularly melamine)
- Polyamides (nylons)
- Amines
- Urea and thiourea
- Phenol

ADDITION COPOLYMERS
- Vinyls (including acrylates and styrene)
- Butadiene
- Natural rubber

MISCELLANEOUS
- Tanning agents
- Fatty acids
- Aldehydes
- Isocyanates
- Polyamines
- Silicones
- Epoxides
- Alpha-halogen ethers
- Halogenated silanes
- Cellulose acetate
- Sulfuryl chloride
- Anhydrocarboxyglycine
- Tung oil
- Mercuric acetate
- Benzoquinone
- Basic aluminum and chromium sulfates

TABLE IV

Mechanisms of Antifelting action

Object	*Mechanisms*	*Treatments*	*References*
I) Reduced differential frictional effect	A) Remove scales	1) Acid chlorination	(8)
		2) Chlorosulfamic acid	(9)
		3) Sulfuryl chloride	(9)
		4) Ozone	(9)
	B) Modify surface	1) Chlorination	(8), (10), (11)
		2) Chloroamide	(8), (9)
		3) Fluorine	(8), (9)
		4) Alcoholic alkali	(7), (9) (11), (12)
		5) Acid permanganate	(9)
		6) Alkaline hypochlorite plus permanganate	(8), (9)
	C) Mask scales	1) Anhydrocarboxy-glycine	(13), (14) (15)
		2) Silicone	(9), (13), (14)
		3) Acrylate	(14), (16)
		4) Styrene	(14)
		5) Butadiene	(14)
		6) Vinyl	(14)
		7) Isocyanate	(14)
		8) Basic aluminum and chromium sulfates	(15)
		9) Cellulose acetate	(15)
II) Altered elastic properties	A) Crosslinking	1) Mercuric acetate	(17), (18)
		2) Benzoquinone	(11), (18)
	B) Internal polymer deposition	1) Ethylene sulfide	(7)
		2) Thiourea-formal-dehyde	(19)
	C) "Spot Welding"	1) Melamine-formal-dehyde	(20), (21)
		2) Anhydrocarboxy-glycine	(15)
		3) Urea-formaldehyde	(9), (22),
		4) Acrylate	(9)
		5) Butadiene	(9)
		6) Vinyl	(9)
		7) Thiourea-formal-dehyde	(23)

were subjected to a series of washes, either a) in a horizontal washer according to Federal Specification CCC-T-191b, b) in the same test employing 0.2% Ivory soap, c) in an agitator-type home washer with the same buffer as "a", or d) in an agitator washer with 0.2% Ivory soap.

Figures 1 to 4 illustrate the results.

Comparisons at equal times of washing showed the wool to shrink faster in the reciprocating wheel than in the agitator washer. Since the latter works the fabric only about 50% of the time (the rest of the time being spent in filling the tub, draining, etc), a comparison at equal time of agitation showed closer agreement in shrinkage. Contrary to the results reported by Weiner, the addition of soap appeared to increase shrinkage in both the horizontal and the agitator washer.

Evaluation of the fabrics containing subminimal amounts of finish showed that each fabric continues to felt until it approaches an ultimate shrinkage value. Type of washer and composition of the washing medium affected only the rate of shrinking. A feltproofed fabric, however, did not shrink, regardless of the test conditions.

On occasion, a properly treated fabric which has been relaxed shrinks during laundering. Consolidation shrinkage then is suspected. One means for identifying consolidation shrinkage is to determine the loss of area of the relaxed fabric as a function of washing time. Since felting is a cumulative process, felting shrinkage will be progressive. Consolidation shrinkage, on the other hand, occurs early in the laundering period and would be revealed by no further loss of area on prolonged washing.

FELTPROOFING

The variety of feltproofing treatments available for wool is suggested by the fact that, to the best of our knowledge, 250 patents on this subject were issued prior to the end of 1957 (6). Of these, six might be considered mechanical processes. With few exceptions, all other known processes, which have been grouped according to general type in Table III, are chemical.

To make wool resistant to felting, each of these materials must affect either the differential friction effect, the elastic properties of the fibers, or both (7). The differential friction effect can be reduced either by a) removing the scales, b) modifying the surface, or c) masking the scales by the deposition of a coating. To change the ability of the individual fibers to stretch and recover would require such treatments as crosslinking, chemical modification, or internal polymer deposition. Some felt-resistant finishes give the apparent effect of modifying the elastic properties of the fibers by immobilizing them in the fabric system. Such an effect has been called "spot welding".

The *modus operandi* of a number of chemical treatments is indicated in Table IV.

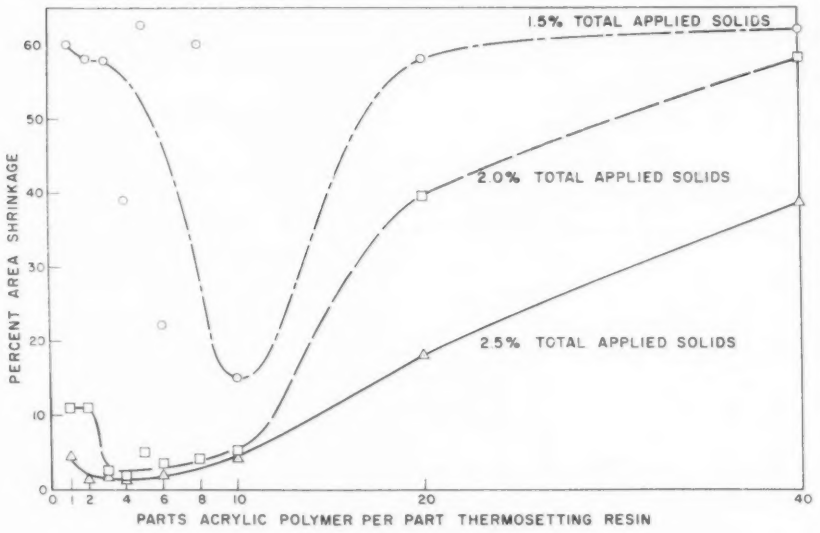

Figure 5
Ratio of ingredients in a thermoset acrylic feltproofing finish

Some materials appear to operate via two mechanism, either employing them at the same time (ie, the scale masking and "spot welding" of the addition polymers) or working through one or the other, depending on conditions (ie, scale removal or surface modification depending on the pH of chlorination).

Many of the patents and other publications that have been examined involve modifications of these processes or combinations of these general types.

A number of the processes listed are merely laboratory curiosities. This may be because felting is reduced but not eliminated, the reagent is offensive or unavailable, side reactions are excessive, the process is not commercially feasible, or desirable properties of wool have been destroyed.

DEGRADATION PROCESS ——— The process most commonly employed in commerical practice probably is chlorination. In its simplest form, chlorination is low in cost and quite effective. Moreover, because it is suitable for application to large batches of small items, such as socks, there is no need for padding or curing equipment.

Halogenation treatments involve chemical reactions that are potentially damaging to the fiber, such as the breakdown of the disulfide link. Since the scales are more resistant to chemical attack than is the interior of the fiber, the halogenation process is quite delicate. Therefore, even if the intent is only to modify the fiber surface rather than to destroy the scales, considerable care is required.

Because the scales are a protective layer around wool, processes which do lead to their complete removal cause severe reduction in the wearing properties of the fabric as well as a loss of weight. Without scales, wool feels thin and cold, sometimes harsh and rough (*8*).

Harris and Frishman (*24, 25*) showed the close control which must be exercised in a chlorination process to avoid yellowing and degradation of the fabric. Control also is needed in the chlorination process to avoid dyeing difficulties (*26*). Furthermore it has been reported that aqueous chlorine seriously decreases the strength of wool in the wet state (*27*).

Even the combination of alkaline hypochlorite and permanganate which has enjoyed considerable commercial success has drawbacks. If applied to greige goods, uneven dyeing and decreased affinity of the dyes results (*9*). And there are few dyes that will maintain their shade and fastness if applied before this treatment.

An indication of the variety of modifications and controls on the halogenation process can be sensed from the fact that 25% of the patents mentioned above concern this feltproofing procedure.

Other degradation treatments, such as oxidation, sulfuryl chloride, papain and alcoholic alkali, also require careful control to prevent excessive damage to the fibers (*28*). There also are other drawbacks to their use. The alkalis involve special machinery and solvent recovery. Enzymes generally require pretreatment; papain is expensive (*29*).

ADDITIVE PROCESSES——— Treatments which increase the weight of the fabric are free from the deficiencies of the degradation processes. They have, however, their own limitations. Those, for example, that operate by fiber bonding are obviously limited to treatment of fabrics.

Melamine-formaldehyde resin treatments provide effective shrink resistance, increase the fabric weight, show no damage to the fabric, and have only small effect on dyes. On the other hand, they may require high-temperature cures or peroxide pretreatment. Their greatest difficulty is the loss of a wool-like hand due to fiber bonding by high add-ons of a thermosetting resin (*9, 29*).

Thermoplastic polymers increase fabric weight, produce no fiber damage, and affect the color of the finished goods only by flattening some shades. Effect on hand depends on the nature of the polymer; soft polymers produce only small changes (*29*). Some of the earliest rubbery polymers used for wool stabilization became hard or discolored on exposure to heat or light. This, however, is a deficiency of the composition of particular polymers.

With respect to other treatments, the literature indicates that shrinkage control is related to increased fabric stiffness in the case of the silicones (*14*) and the polyamide-polyepoxides (*4*).

ACRYLIC FELTPROOFING AGENTS

As was indicated in Table IV, addition polymers stabilize wool by scale masking or "spot welding." Consequently the drawbacks of a degradative process are avoided. Furthermore, if applied as an aqueous dispersion, such polymers could be employed in a continuous process instead of the batch operation which certain treatments require.

Copolymers of acrylic and methacrylic esters can be produced in a wide range of polymer hardness and these compositions are known for their stability to heat and ultraviolet radiation. They also are free of color. Consequently the use of such compositions as feltproofing finishes for wool was investigated.

TABLE V
Effect of polymer softness

Ti (°C)	Applied Polymer (%) 6.0	4.5	3.0
	Area Felting Shrinkage (%)		
	GROUP I		
18	9	30	41
−15	6	27	45
−23	4	14	40
−40	1	3	12
	GROUP II		
− 3	56	58	—
−14	56	57	—
−39	6	19	—
	GROUP III		
−14	—	34	—
−38	—	2	—
Untreated wool		66	

POLYMER PROPERTIES——To be effective as a feltproofing agent, the finish must resist removal from the fiber during laundering. This durability can be achieved by chemically linking the surface deposit to the fibers (*9, 15*). Attempts to fix a polymer on wool through electrical effects are reported to have failed (*14*).

Other generalizations on the best polymer properties also can be found in the literature. Alexander (*9*) discussed butadiene-methyl methacrylate systems which failed to stabilize at high methyl methacrylate content because the polymer was too hard and brittle and failed to stabilize at high butadiene content because the polymer was too rubbery. The physical state of organosilicon polymers also determined whether a finish would shrinkproof wool. Oils, soft rubbers, and waxy silicone plastics were without effect on felting. Stabilization was achieved only by the deposition of a solid three-dimensional polymer (*14*).

An indication of the relation between polymer softness and shrinkproofing effect was obtained using three groups of acrylic polymers each modified to provide thermosetting action. Within each group the polymers covered a range of hardnesses; the thermosetting mechanism of a group was the same. Using the second order transition temperature as a measure of the polymer softness (Table V), it is apparent that the feltproofing effect within a group increased as the samples became softer.

It also is obvious that the nature or extent of the thermosetting is important since there is a profound difference in the efficiency among the groups.

THERMOSETTING THE POLYMER——An acrylic polymer (Rhoplex HA-1) capable of reaction with a thermosetting resin was chosen for development as a wool stabilization finish. Figure 5 shows the general relation at subminimal amount of finishing agent between stabilization and the ratio of this thermoplastic polymer to a thermosetting urea-formaldehyde resin. It is apparent that the ratio of ingredients becomes less critical as the total concentration approaches that required for complete stabilization of the fabric.

The samples in Figure 5 which were treated with 2.5% applied solids also were examined before laundering for discoloration and stiffness. On these fabrics, yellowing increased as the concentration of the thermosetting resin increased. Softness increased markedly in going from a 1/1 to a 5/1 ratio of acrylic polymer/thermosetting resin. Beyond that, the changes of hand were slight. Thus, considering shrinkproofing, color, and handle, the best ratio for these materials was in the range of one part of the thermosetting resin for every five to 10 parts of the acrylate.

A polymer capable of thermosetting without addition of a nitrogen-formaldehyde resin also was evaluated. At equal total finish on the wool, the fabric containing the sole finish was slightly softer. Elimination of the external thermosetting resin undoubtedly accounts for the difference.

CURING THE POLYMER——To accentuate differences in extent of curing, a subminimal amount (2.5% applied solids) of a 9/1 solids mixture of an acrylic polymer and a thermosetting resin was applied by padding to a woolen flannel. Samples were taken directly from the pad to the oven and, after designated heating periods, the samples were removed from the oven, weighed to determine the change in water content, and then laundered. Figure 6 shows the relation between time of curing, felting shrinkage, and the fabric weight referred to the oven-dried state of the untreated fabric.

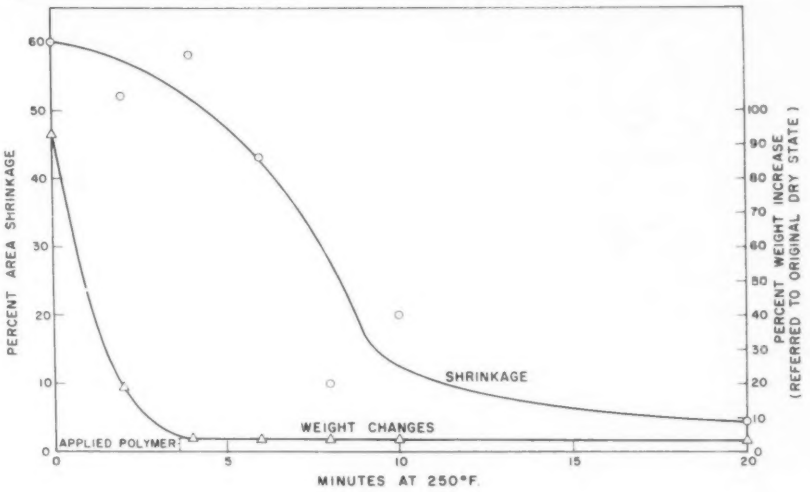

Figure 6
Relation of curing rate and shrinkage

Most of the water is gone in four to five minutes. Then the greatest change in feltproofing takes place in the next five minutes. Beyond that time, improvement in stabilization is slight. It is difficult to generalize curing conditions in terms of time and temperature because of the diverse heat transfer associated with different ovens and with different fabrics, but from Figure 5 it can be said that the minimum time and temperature required to cure the acrylic finish on dry fabric is approximately equal to the time required to make a padded sample completely dry. On this wool a slightly higher level of finish would have provided complete stabilization.

APPLICATION OF THE POLYMER——Crosslinked acrylic wool finishes will impart effective feltproofing with from 1.5% to 15% applied solids. A great many factors influence the amount of finish that is required (*6*). Worsteds, for example, generally need less than woolens; woven fabrics need less than knitted ones. Fabrics made of loosely spun yarns of low count and low twist usually are more difficult to stabilize than fabrics woven from fine, tight yarns. The higher the construction, the more easily shrinkproofed the wool. Weight, thickness, direction of yarn twist, extent of plying, and the presence of other fibers influence the final result.

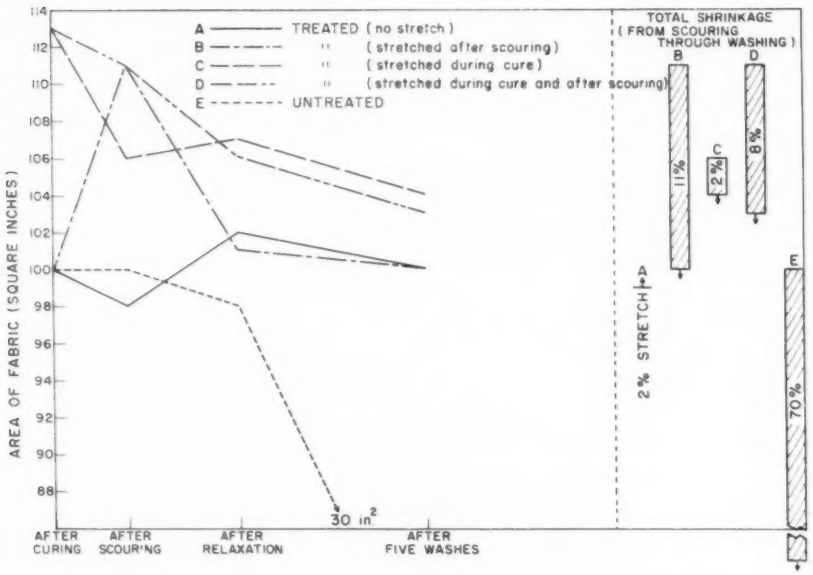

Figure 7
Effect of stretching on the total shrinkage of wool

The preparation of goods for treatment with the acrylic feltproofing finish consists of only one step—thorough cleaning. Processing oils and other greasy or fatty contaminants must not be present. If any oily soil is allowed to remain, the resin will not be able to exert its full effect. Small quantities of residual acid from the carbonizing process may remain on the goods without adversely affecting the finish. This acid may even act as a catalyst during the curing step.

Certain wools are difficult to stabilize in spite of the fact that they have been thoroughly scoured. It is believed that this is due to the epicuticle, which is smooth and offers poor lodgment for the acrylic finish. In such cases a mild peroxide bleach has been found to be beneficial. When the epicuticle is ruptured by the oxidation, a rough topography results wherein the resin can become anchored. In the laboratory an unbleached fabric which required 7.5% applied finish for complete stabilization needed only 3.0% after bleaching.

Afterwashing helps break the resin bonds which hold adjacent fibers and yarns together. Since the acrylic finish functions by altering the differential friction effect, these "spot welds" are unnecessary. During the wash, hand and drape characteristics can be further modified by the incorporation of softeners and other auxiliaries.

It has been pointed out that control of yarn and fabric structure can be an imporant adjunct to chemical treatments (*29*). To demonstrate the effect that mechanical handling has on the apparent shrinkage of wool, we treated four sets of fabrics with a thermoset acrylic finish. The four sets were then handled in different manners. One group was cured at its original dimensions, afterscoured in 0.01% Triton X-100 at 100°F for five minutes, rinsed, and dried at its original dimensions. Another set was handled in the same way except that it was stretched during the drying stage. A third set of fabrics was stretched during the curing operation only, while a fourth set was pulled out during the drying operation as well as during the cure.

Figure 7 indicates the average area of the samples after curing, after scouring and drying, after the relaxation process, and after five washes made in accordance with Method 5554 of Federal Specification CCC-T-191b. An untreated set of fabrics was included in the relaxation and wash tests.

The bar graphs in Figure 7 show the magnitude of the change of area that these wools undergo from the scouring operation to the final state after five washes. That the finish is effective is shown by the difference in shrinkage between the untreated samples and the remainder of the group. Within the group of treated samples, however, only the one with no history of stretching shows no area shrinkage. Those pulled out during the cure appear to be stabilized at slightly larger than original dimensions but they have associated with them varying degrees of total shrinkage (relaxation plus felting plus consolidation shrinkage).

Thus, it was concluded that maximum stabilization is achieved on fabrics which are maintained and handled slack.

COMPARISON OF FINISHES—Having established the optimum conditions for applying the acrylic polymer, arrangements were made for a direct comparison of acrylic-treated samples and samples made resistant to felting by a commercially employed degradative process.

From one mill (A) we received untreated, acrylic-treated, and chlorinated samples of the same fabric style.

Information on the fabric before treatment indicated that the material was a 9.6-ounce blend of 85/15 wool/nylon which had been fulled, scoured, carbonized, dry milled, dyed, dried, sheared on one side, and which contained 1 to 2% sulfuric acid from the dyeing operation.

The treated sample contained 3% applied polymer. The fabric had been dried for five minutes at 255°F, and the finish had been thermoset by passing the fabric through an oven at 275°F for 10 minutes. The cured fabric was scoured at 130°F for 20 minutes in a dolly washer containing nonionic surfactant, rinsed in water for 40 minutes, scutched, water mangled, frame dried, brushed, sheared on both sides, sponged and semidecated.

The chlorinated sample had been given a standard treatment. No details were supplied.

From another mill (B) we obtained samples of a chlorinated and an untreated woolen fabric. The latter we treated in the laboratory with 4% applied finish. The sample was dried for five minutes at 240°F, cured for five minutes at 270°F, scoured for five minutes at 100°F in a bath containing 0.01% nonionic surfactant, rinsed with water, framed to dimensions, and dried for five minutes at 240°F.

The following tests were run on both sets of fabric:

A) Shrinkage (reported as % area lost).
1) Relaxation
Federal Specification
CCC-T-191B Method 5558.
2) Felting
Federal Specification
CCC-T-191B Method 5554.

TABLE VI
Comparison of feltproofing treatments

	Relaxation	Area Shrinkage (%) Felting 1st wash	2nd wash	3rd wash	4th wash	5th wash	Total	Pilling	Color
Mill "A"									
Untreated	4	11	14	14	16	16	20	some	unchanged
Chlorinated	6	2	2	2	2	2	8	very slight	faded
Acrylic treated	2	4	4	4	4	4	6	none	unchanged
Mill "B"									
Untreated	6	26	36	40	44	47	53	considerable	darkened
Chlorinated	4	4	2	4	2	0	4	slight	faded
Acrylic treated (Laboratory application)	2	2	4	4	6	5	7	none	unchanged

	Crease recovery (degrees)		Physical Properties: Tear (lbs)		Tensile (lbs)		Stiffness (mg)		Abrasion (cycles)	Effect of light: Stiffness (% increase)	Color	Effect of aging: Stiffness (% increase)
	W	F	W	F	W	F	W	F				
Mill "A"												
Untreated	145	135	157	109	37	24	11	9	45,000	9	faded	0
Chlorinated	148	147	144	116	32	20	10	8	30,000	10	faded	20
Acrylic treated	149	143	150	101	37	22	13	9	39,000	0	faded	−8
Mill "B"												
Untreated	128	127	137	115	31	24	10	10	28,000	10	faded	20
Chlorinated	154	144	132	108	26	19	9	8	8,400	11	most faded	11
Acrylic treated (Laboratory application)	143	139	146	107	33	22	14	12	57,000	0	least faded	28

This test was repeated for a total of five measurements.

3) Total
Sum of relaxation, felting, and consolidation shrinkage after fifth wash.

B) Pilling.
Washed samples were rated visually with regard to the degree of surface fuzz and pills.

C) Washfastness of Color.
Washed samples were rated visually with regard to the degree of color change compared to the unwashed fabrics.

D) Crease Recovery (reported as degrees).
Shirley Institute Crease Recovery Method

E) Tear Strength (reported as units).
Elmendorf Tear Test

F) Tensile Strength (reported as pounds).
Ravelled one-inch strips on Instron at 10 inches per minute jaw speed with three-inch jaw separation.

G) Stiffness (reported as milligrams to bend a standard sample size)
Gurley Stiffness Tester

H) Abrasion Resistance (reported as cycles).
Tootal-Broadhurst-Lee Abrasion Tester

I) Effect of Light.
Change of stiffness after Fade-Ometer exposure of 100 hours according to Military Specifications MIL C-2814.

The data are in Table VI.

The apparent reduction of relaxation shrinkage due to treatment with the acrylic polymer is not particularly desirable since this shrinkage may appear later as consolidation shrinkage. The calculated felting shrinkage, which is the difference between total and relaxation shrinkage, obviously is influenced by such factors. These fabrics do show that the total loss of area has been reduced to the same extent by the acrylic polymer and by chlorination.

It has been pointed out that washable wool is not completely "easy care" wool (*30*). When wool is laundered, it tends to pill and fuzz because fiber ends migrate to the surface. The comparison of the additive and the degradative stabilization processes show that, while both reduce the tendency of washed wool to have an unsightly surface appearance, the acrylic treatment is far superior in minimizing pilling and fuzz formation. (See Figure 8).

Chlorination appeared to reduce the washfastness of the dyes while the acrylic treatment maintained the original color through the entire series of washes.

The crease recovery of the untreated fabric was improved by both treatments while the effects on tear strength were negligible. Tensile strength, however, was reduced in both cases, more by chlorination than by the acrylic polymer.

Stiffness was reduced by the degradative process and was increased by the additive process. This is to be expected when it is remembered that the acrylic polymer provides a net weight gain to the fabric rather than a costly weight loss. What the stiffness numbers cannot show is the fact that the change which the acrylic polymer produces is in the bulk or body of the fabric. On many flimsy fabrics the acrylic polymer upgrades the hand. Since the acrylic is a soft polymer, it does not produce the boardiness or harshness encountered with treatments comprising only thermosetting resins.

The abrasion resistance of the fabric is reduced by chlorination. Treatment with the acrylic polymer produced a fabric with better abrasion resistance than that of the chlorinated sample and in one case even better than that of the untreated fabric. On laboratory-treated fabric, abrasion resistance up to 300% better than that of the original untreated fabric has been observed.

The acrylic polymer provided at least one of the dyes with some protection against color fading due to the action of ultra-violet light. No stiffening of the polymer due to the action of the light could be detected.

While accelerated aging caused various increases and decreases in stiffness, none of the samples exceeded the 30% increase in stiffness specified as a maximum in MIL-C-2184.

CONCLUSION

The use of acrylic polymers as feltproofing agents for wool has been described. These finishes compare favorably with other available treatments with regard to their ability to stabilize wool. Moreover, they avoid the undesirable effects on secondary fabric properties from which other commercial treatments suffer.

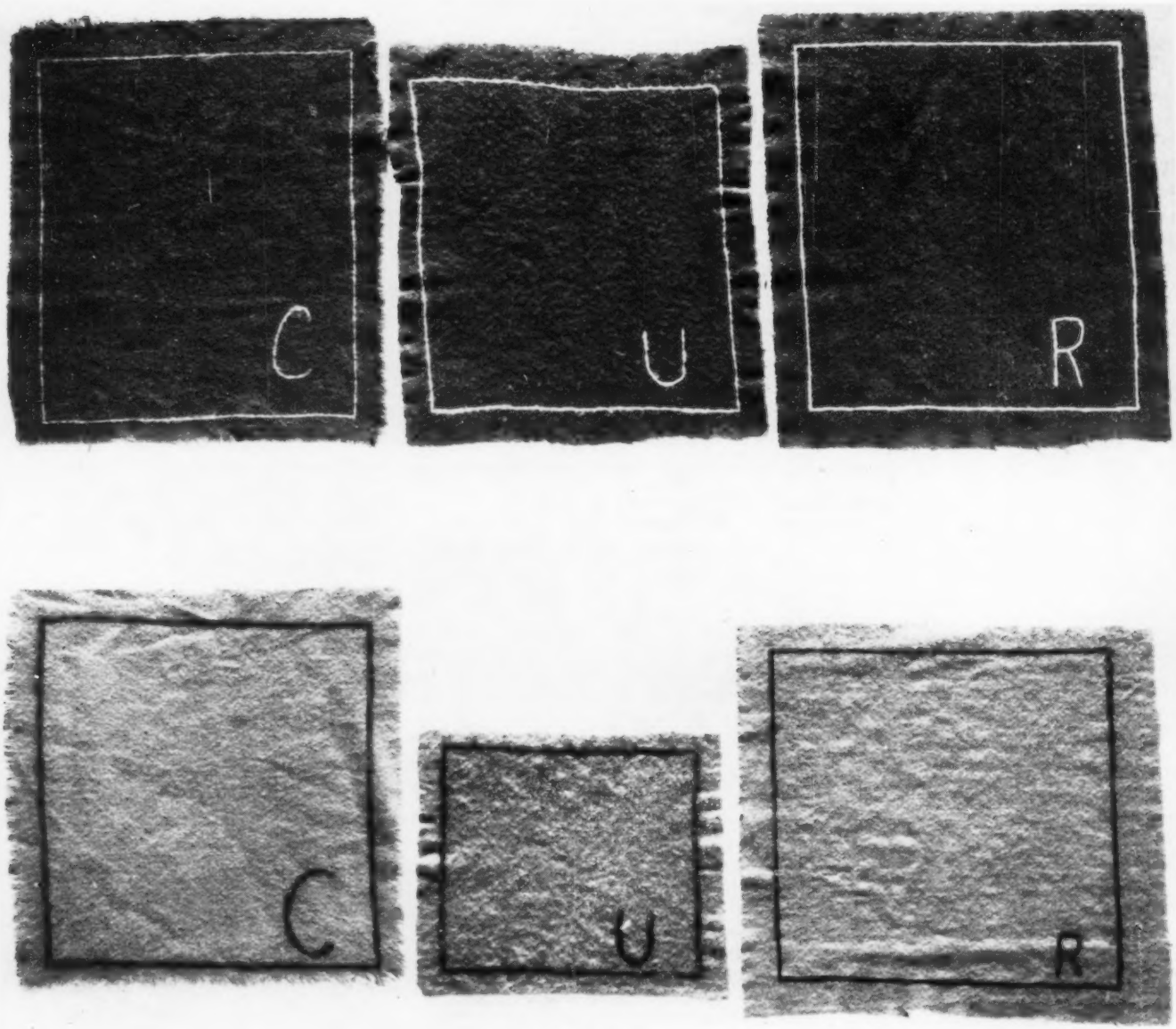

Figure 8
Fabrics after laundering. Mill "A", top; mill "B" bottom.
C = chlorinated, U = untreated, R = Rhoplex HA-1.

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1960 National Convention———

THE DYEING OF ACRILAN 16 AND ACRILAN 16/ACRILAN 1656 BLENDS

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Regular Acrilan, or Acrilan 1656, as it is called at Chemstrand, is dyed with a variety of dyestuff classes. Acrilan 16 is dyed with disperse and cationic dyes only. This puts Chemstrand into the unique position of having two fibers which can be combined to produce a 100% acrylic fabric which can be piece dyed into solid shades or into two colors by a simple one-bath method. The dyeing procedures for dyeing fabrics of 100% of one or the other fiber, of blends of the two fibers, and of blends of these fibers with other fibers, especially rayon and wool, are briefly explained.

INTRODUCTION

THE history of textile fibers is as old as the history of man and as the beginning of the history of man gets pushed farther and farther back into an ever more-distant past, so does the history of textile fibers. From the Bible we learn that fig leaves were the first material man used to cover his body. The reason for this first covering was that he was ashamed of his nakedness. Looking at the bathing beaches of today, we are convinced that that phase of man's evolution has run its course.

As man pushed his frontiers farther and met harsher climates, he looked for something more substantial than leaves, and the next milestone in the development of textiles was animal skins. Next, instead of killing animals to get their skin, man learned to take the hair off these animals' bodies and spin it into yarn from which he made fabrics. Then, instead of painting his body, he started to decorate the fabrics with colors.

A further milestone was erected at the point where man learned to use vegetable fibers, such as linen and cotton. He learned to rob the silkworm of the fruit of his labor, and silk eventually became a synonym for luxury and riches. It became the garb for emperors, kings, princes, and the highest dignitaries of the Church, and for thousands of years silk, wool, cotton and linen were the mainstay of the growing textile industry. Then came the dawn of the Twentieth Century. Man accelerated his activities in all fields of endeavor, except perhaps in his spiritual development, but science, technical-know-how, industrial and commercial development began to boil and bubble like a regular witch's caldron. Within the span of sixty years, shorter than the wink of an eyelash in the history of this world, we have seen developments which a hundred years ago were deemed too fantastic even in science fiction. Today, we think nothing of picking up a telephone and in a few minutes talk to someone more than half way around the world. The automobile has developed from a roaring one-cylinder monster that stampeded horses and cattle, into a sleek, softly purring vehicle, which everyone can afford and considers a necessity. Man has left the ground and taken to the skies on wings faster than an eagle's. He is even knocking at the portals of space. He is already planning a timetable for reaching the moon and the stars.

True to our earliest history, textiles have kept pace with man. New milestones have been erected. The silkworm lost much of his glamor when man imitated him and began to spin artificial silk. Encouraged by this success, man's inquisitiveness wanted to know why he could not make other fibers out of materials which were not in his inventory of textiles, and so nylon was born. In keeping with man's ever-accelerating pace in other fields of endeavor, he also widened this search for still other fibers, and nylon, instead of being merely a milestone, proved to be an open flood gate to new inventions, and nobody knows where it will lead. The difficulty confronting the inventor today is not how to make a new fiber but what to do with it when he has it.

After nylon, came the polyesters and almost simultaneously the acrylics.

It would be presumptuous of me to try to enumerate in twenty minutes the properties and merits of these fibers, but I should like to discuss with you briefly some of the features of two acrylic fibers with which we at Chemstrand are involved.

DISCUSSION

Each acrylic fiber, by reason of its composition, has its own dyeing requirements. Acrylic fibers like the polyamides and polyesters, are hydrophobic and, therefore, do not absorb dye liquor readily. Compounds such as vinyl acetate, methyl acrylate, methyl methacrylate, etc, are added by the manufacturers, and these, by decreasing the compactness of the acrylonitrile chains, allow dyes to penetrate more easily.

Basic compounds are added in order to create dye sites for anionic dye absorption. Many such compounds are available but they must be chosen very carefully as they have an enormous influence on the dyeability of the fiber.

In our regular Acrilan, which we call Acrilan 1656, we have both basic and acidic groups. It is made in a variety of deniers and staple lengths and in its greige state it looks creamy. It is dyeable with all the dyestuffs which will dye wool and also with disperse and basic colors, some naphthols and chromes. It can also be dyed with vats and sulfurs, but, in view of the ease of dyeing which the other dyestuffs offer, we have not pursued the development of dyeing procedures for vats and sulfurs and have very little information available at this time regarding them.

In our Acrilan 16, no dye sites have been provided for any but the disperse and cationic dyestuffs. This fiber, which has been on the market since early 1960, cannot, however, be considered a completely new product. It is an improvement of the Acrilan 16 which has been on the market for some time. Textile fibers, like automobiles, in fact like any other product on the market, must have constant attention on the part of the

*Presented October 7, 1960 at the 1960 AATCC Convention held at the Sheraton Hotel, Philadelphia, Pa

research and development departments of their manufacturers in an endeavor to add improvements whenever and wherever possible. In the textile industry, we may, in passing, glance wistfully at the status quo but we may never indulge in it. We must forever go forward. Rapidly changing fashions demand it and, more important, the ultimate consumer demands ever higher standards of quality.

Acrilan 16 is considerably whiter than Acrilan 1656, but aside from its color, it is very similar to Acrilan 1656 in its other physical characteristics. With the disperse dyes we can produce a full color range from pale pastels to black on Acrilan 1656, but on Acrilan 16 they do not readily exhaust in heavy depth. Usually we consider a total dyestuffs content of 4% the limit of depth obtainable with disperse colors. Basic dyes are well suited for dyeing all shades, including black, on Acrilan 16.

The dyeing of 100% Acrilan 16 material is remarkably simple. A light scour at 160-180°F with 0.5 to 1% of an nonionic detergent and 0.5% of TSP or TSPP is recommended. If a great deal of spinning or loom dirt is present, we might have to go to a somewhat more severe scour.

To meet the requirements for very bright pure whites, we bleach Acrilan 16 in a mild sodium chlorite bleach. A maximum of 0.5 gram per liter of sodium chlorite will produce an excellent white. Optical bleaching agents can be added to enhance the whiteness of the bleached material. Quite often, in fact, optical bleaches are sufficient to obtain the desired white on the unbleached fiber.

Disperse dyes, in general, have excellent dyeing properties on Acrilan 16. With proper dyestuff selection, we can obtain 40 hours lightfastness and a 140°F washfastness in shades up to the medium heavy range. Disperse dyesuffs also have certain limitations on acrylic fibers when bright shades, such as bright reds or bright blues, have to be produced. For such shades we resort to basic dyes.

Basic dyes exhibit excellent light- and washfastness properties on Acrilan 16 and because they have good buildup properties, a full range of shades from pastels to black can be obtained economically without difficulty. For the dyeing of light and medium shades on Acrilan 16, we use cationic retarder to control the dyeing rate, which is more rapid on Acrilan 16 than it is on Acrilan 1656. Not all retarders are of equal strength, and, depending on this strength, we use from 0.5% to 1% of retarder for light and medium shades. For heavy shades, such as navies, browns and blacks, retarder is not necessary.

The most interesting development resulting from the availability of two acrylic fibers with different dyeing characteristics has been the production of two-color dyeings of 100% acrylic fabrics in a single bath. The reason for this is found in the fact that basic dyes are best applied to Acrilan 1656 from a neutral or slightly alkaline dyebath. The more we lower the pH, the more we lower the absorption of basic dyes on Acrilan 1656, until at a pH of 3 or lower there is only a very faint staining of Acrilan 1656 by basic dyes.

Acrilan 16, on the other hand, has excellent affinity for basic dyes and can be dyed to any practical shade at almost any pH range below 8; therefore, if we have a fabric in which both Acrilans are blended, we can make use of the affinity of Acrilan 1656 for wool dyestuffs by making up the dyebath with such dyestuffs for Acrilan 1656 at a pH of 3 or lower, adding at the same time the basic color which will be absorbed even at such a low pH by the Acrilan 16.

When both acid and basic dyes are used in the same dyebath, we add 1% Peregal TW, an alkylpoly(ethyleneoxy)glycolamine, in the dyebath to prevent coprecipitation of the acid and basic dyes.

If only the Acrilan 16 or the Acrilan is to be dyed, a nonionic surfactant may be used in place of Peregal TW although this is not absolutely necessary. However, Peregal TW must be used to prevent coprecipitation of the anionic and the cationic dyes whenever both fibers are dyed.

When dyeing light shades on 100% Acrilan 16, the use of a cationic retarder becomes desirable and a retarder might also be useful for leveling when dyeing the Acrilan 16 component of a fabric which is made up of both Acrilans. However, cationic retarders are not compatible with the anionic dyes used for the Acrilan 1656. Under such conditions, we replace the Peregal TW with 1% Igepal CO-710, an alkylphenoxypoly(ethyleneoxy)ethanol, and 0.5% of cationic retarder.

The dyer is often asked, when dyeing a blend, to match the effect shown in the standard which is sent to him with the dye order. Unless the material which he has to dye is made up of the same fibers and of the same percentages of these fibers as the standard and of similar yarn counts and construction, such matching is impossible. In tubular knit jersey, where heathers have been extremely popular this past year, two specific blends have contributed great versatility to the dyeings of two-tone effects from light to dark. One blend is made up of 15% Acrilan 1656 and 85% Acrilan 16. The other blend is the reverse, 85% Acrilan 1656/15% Acrilan 16. In most of these heather tones, one fiber is left undyed; therefore, when we dye the Acrilan 16 a black, a dark brown, a dark olive, or a navy, we obtain a quite light heather. When we dye these same shades on the other blend, which contains 85% of the Acrilan 1656, the effect, of course, is a dark heather.

In men's half-hose, a blend of 76% Acrilan 1656/24% Acrilan 16 has proven most versatile. We can dye heathers with it as well as union shades.

In addition to the heathers, very attractive plaids and stripes can be produced by piece dyeing. The important consideration in all these dyeings is to select the Acrilan 1656 always for the dark shade and the Acrilan 16 for the light or bright shade.

Blends of various percentages of Acrilan 16 and wool will be coming into your dyehouses in increasing volumes. Various dyeing methods have been proposed for this blend by our dyestuff manufacturing friends. These methods are under careful investigation at the present time in our laboratories, and we hope to be able to publish information on them shortly.

In the meantime, we recommend for the dyeing of Acrilan 16 and wool blends our own method which calls for the use of basic dyes on the Acrilan 16 and acid and acid metallized dyes on the wool. Our method is suitable for the dyeing of union shades as well as for cross dyeing. Omitting here any discussion of possible finishing procedures, such as carbonizing, fulling or crabbing, I will give you an outline of the actual dyeing procedure.

The dyebath is set at 120°F with 1.50% Triton X-67 Flake (polyethylene ether), 0.75% Chem-acril, add the sulfuric acid necessary for the particular shade and run for ten minutes at 120°F. In the meantime, the basic dye component is dissolved separately and added to the dyebath. Circulation of the dyebath continues and after thorough circulation, the previously dissolved acid dye component is added to the dyebath. We

now bring the temperature to the boil over a period of 45 minutes and run 60 minutes at the boil. We now take a sample and if a color add is necessary, we prepare the basic dyes and the acid dyes again in separate containers before adding them to the dyebath. In the meantime, we have let the dyebath cool to about 190°F, and after making the add we bring it to the boil again and run at least 30 minutes before taking another sample.

When the correct shade is obtained, we allow the dyebath to cool to 160°F. Normally, we say that this is done by radiation, but it can also be done by adding hot water of, for example, 160°F. If cold water is added to the dyebath, care must be used not to let it hit the material which is being dyed. It is safe, however, to add cold water in a thin stream in the mixing compartment, but never in the back of the dyebeck. When the bath has cooled down to 160°F, we rinse by overflowing and after a thorough rinsing of the goods we scour for 30 minutes at 130°F with 10% sodium formate, 2% diammonium phosphate and 1% nonionic detergent. This rinsing method insures complete neutralization of the goods. By the use of this formula, we can neutralize at 130°F. This is due to the fact that the sulfuric acid remaining in the goods, even after a thorough rinse in warm and cold water, is changed into formic acid, which subsequently washes out easily. If we want to remove the more stubborn sulfuric acid by the normally used neutralizing mediums, such as ammonia, TSP, soda ash or sodium bicarbonate, we would have to raise the temperature to 160°F and this is not always advisable, since at this temperature some color might be removed in a strongly alkaline medium.

Some times we find in a dyehouse, not on account of any human failings but purely through acts of God, some dye lots which are off-shade, blotchy, or full of dye spots. Trouble of this kind is always annoying, costly and sometimes quite difficult to correct. You may be interested in having me mention a few techniques of rehandling such dye lots.

Unlevel dyeings made with disperse dyes can be corrected on both Acrilan 1656 and Acrilan 16 by simply scouring in a fresh bath at the boil. On Acrilan 16, it is especially important to bring such a bath to a good full boil as the wetfastness of disperse dyes on Acrilan 16 is very good and levelling will not take place readily at temperatures below the boil.

On Acrilan 1656, we can correct dyeings made with basic dyes by treating the goods in a fresh bath containing an excess of cationic retarder plus sulfuric acid at the boil. This treatment will greatly reduce the shade and give the dyer room for redyeing.

Dyeings made with cationic dyes on Acrilan 16 can only be removed with Textone stripping and special care must be taken to execute this stripping evenly so that goods can be redyed without producing blotchy dyeing.

An unsatisfactory dyeing made with acid dyes on Acrilan 1656 can be corrected by scouring in a strong acid bath containing approximately 6% sulfuric acid with 20% Glauber's Salt. In most cases, acid dyes can be pulled down with alkaline scours. However, this technique should be avoided wherever possible because strong alkalis are difficult to remove from acrylics and often make level redyeing extremely difficult.

CONCLUSION

I should like to conclude my remarks on the note on which I started. As the newsreel used to say, "time marches on;" and as time marches on it brings almost daily a new development. The array of new fibers will become more and more bewildering, but a dyer cannot exist very long in a state of bewilderment. He must know what he is doing or rather what he has to do and how to do it, and this points out the fact that dyeing today is no longer an art or a craft. It has become a chemical process. The sooner a dyer recognizes this the quicker will he be able to make the necessary adjustments. No dyer can stay the hand of a clock by refusing to learn how to handle a new fiber or even by postponing his education regarding a new fiber. On the other hand, this is an age of specialization and we who make two Acrilans consider ourselves specialists in processing these fibers. We invite you, therefore, to use our services freely. I am confident that both you and we can benefit by working together on your problems.

TRADEMARKS

The following registered trademarks have been used in this paper:

Acrilan—The Chemstrand Corp

Peregal—General Aniline & Film Corp

Igepal—General Aniline & Film Corp

Triton—Rohm & Haas Co

Textone—Olin Mathieson Chemical Corp

Future Papers

THESE papers have been submitted for publication in future issues of the *Proceedings:*

"Construction Limits of Fabrics Containing Creslan Acrylic Fiber"—H C Haller, American Cyanamid Co

"Science and Craft in Color"—Panel

"Modern Continuous Dyeing Processes"—Richard Kern, Sandoz Ltd

"Rovana—Versatile New Yarns"—Charles R Sheehan, Dow Chemical

"The Importance of Odor Control in Textile Processing"—Breckinridge K Tremaine, Rhodia, Inc

"Fabric Development from a Practical Dyers's Standpoint"—James Greer, Greensboro Finishing Co, Burlington Industries

"A Study in Union Dyeing"—Northern New England Section

"Selection of Direct Dyestuffs for Application to Undesulfured Rayon Staple"—Southeastern Section

"Dyeing with Vinyl-Sulfone Reactive Dyes"—H Luttringhaus, Carbic-Hoechst Corp

"Status of Nonwoven Fabrics in the Textile Trade"—Howard W Shearer, American Viscose Corp

"New Fibers from DuPont"—Milton M Christie, E I du Pont de Nemours & Co, Inc

"Recent Developments in the Dyeing of Verel Modacrylic Fiber"—R J Fortune, Tennessee Eastman Co

"New Color-Measuring Instruments for Use by the Textile Industry"—F J Rizzo and A O Ramsley, Quartermaster Research and Engineering Command, U S Army

"The Applicaton Principles of Acrylic Backcoating"—Charles E Hoey, Rohm and Hass Co

"Dyeing Zefran Acrylic Fiber in Blends"—F M Rawicz, Dow Chemical Co

"American Standard Performance Requirements for Textile Fabrics"—Ephraim Freedman, Macy's Bureau of Standards

"Shade Control for Military Textiles Used by the U S Army Quartermaster Corps"—F J Rizzo, QM R & E Command

"The Effect of Weft Yarn Twist upon the Properties of Cotton Fabrics Before and After Resin Treatment"—Edna Meshke, Univ of California

Metropolitan Section———

AIMS AND OBJECTIVES OF AATCC*

ELLIOTT MORRILL
Corn Products Co
President, AATCC

IN approaching my subject and thinking about what I would say to you this evening, I turned to the Objects of our Association as they appear in our Constitution.

Because the fifty-three words of which they are composed so accurately portray the very reason for the existence of AATCC, and since an educated guess would be that it has been sometime since most of you have looked at them, let us review them together.

"The Objects of the American Association of Textile Chemists and Colorists are:

To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

To encourage in any practical way research work on chemical processes and materials of importance to the Textile Industry.

To establish for the members channels by which the interchange of professional knowledge among them may be increased."

In all fairness to those of you who are also members of the American Chemical Society, you will immediately recognize that I have, in a sense, imitated President Arthur C Cope's message to the ACS. Like Doctor Cope, I would also state that our goal for 1961 would be to enlist the support of our membership to apply thought and energy to finding better ways to accomplish our stated objectives.

Now at this point I should quit and stay ahead in the game, because, indeed, I have stated the aims and objectives of AATCC. However, I have the modest hope that you might like to know how I interpret these constitutional objectives of our Association, for it is within the framework of the Objectives, Constitution and Bylaws of AATCC that I will scrupulously conduct the administration for which you have elected me and made me accountable.

It is fitting that I should make my first talk as president of AATCC before the Metropolitan Section for two reasons. First, because the initial meeting of AATCC that I attended was a New York Section meeting in 1924 and I was sponsored by two New York Section members. Second, because I have the honor to follow in the footsteps of your own Weldon Helmus, the fifteenth president of AATCC—a gentleman for whom I have the highest personal affection and regard and a man who came from your Section to serve two years as president of AATCC with dignity and dedication to his office.

ELLIOTT MORRILL

In his annual address in Philadelphia before the AATCC 1960 National Convention, President Helmus made a statement that seems to me to clearly define the direction that AATCC should take in implementing the objectives of our Association.

Allow me to read this statement as it appears in the October 31st *Proceedings:*

"Our first obligation is to our members. Our second major responsibility is to the industry. I I can envision a three-point program which will help our members stay in the industry and help industry stay in business.

First, let us point our research program more directly to the consumer, providing a technical and scientific bridge between our industry and the consuming public.

Second, let us sharpen up our services to our members in an effort to elevate their professional and scientific status so that qualified men and women will continue to be attracted to the textile industry. We can do much to bring into focus an image of career opportunities in textiles.

And third, and this will need the full support of the industry itself, let us strengthen our research program on all fronts."

Having defined our objectives and the direction we should take as an Association in the broadest of terms, and using this as a base, let me now be specific.

First, let's take a look at our Association and see what kind of an organization we have to work with and see what capabilities we have to accomplish our aims.

We are a technical society of individual members, dedicated to the dissemination of knowledge and the advancement of technology and committed to the obligation of service—service to our membership, service to our industry, and service to the public—as an Association and as individual members. Is not this the image of our AATCC that you and I and all members have truly created?

When I was admitted to membership in AATCC thirty-five years ago we had on our rolls 656 Active Members, 166 Junior Members and 8 Corporate Members. As of January 6, 1961, we had 6,040 Senior Members, 236 Junior members, 855 Associate Members, and 279 Corporate Members, as well as 176 Student Members, a total of over 7,500 members.

In 1961 our individual members are grouped together in what are really sixteen AATCC's—each of our Sections being virtually an autonomous, self-governing body with its own officers, its own bylaws, its own history and its own traditions.

Tonight AATCC is meeting right here in this room—but AATCC is also meeting in Greenville, SC and in Dedham, Mass as Sections. Beyond that I am certain that small groups of AATCC members are meeting and talking and thinking about common

*Presented before the Metropolitan Section at the Hotel New Yorker, New York, NY, on January 20, 1961

problems relating to their AATCC and professional activities throughout the United States.

From this view, I think you will all agree that AATCC begins with each of us as individuals and that the strength and success of our society depends upon how much you and I are willing to contribute to its well-being. What each of us puts into AATCC should be returned to us seven thousandfold—at least in part.

In no way can any of you make a greater contribution to AATCC nor receive greater value in return for your effort than by participating in the activities of your Section.

Your Section is your first point of contact with the AATCC organization. It offers unlimited opportunity for everyone as an individual to serve his own professional interests, and to serve his fellow members and his industry.

The group of sixteen AATCCs has, by means of the Council at the national level, adequate machinery to coordinate and to provide overall policy without interfering in the affairs of the Sections, thus giving strength to the organization as a whole. The vitality of your national organization is derived from the Sections because it is the Sections through their representatives on the Council which actually run the Association. The Council underscores the character of our Association as a national society since it is composed of elected members from all geographical areas of the United States and all of the sixteen Sections. Your Councilors come from all segments of the textile and related industries and they work together to shape program and policy to meet the continually changing needs of our Association.

Stemming from the Council, which could well be described in a business sense, as "Top Management," for our Constitution provides that "The affairs of the Association shall be managed by a Council," are three major executive groups.

The first of these—the Executive Committee of the Council—exercises general supervision of the management of the Association, subject only to the Council, and coordinates the policies of all standing and special committees. This is the group that provides the day-by-day management functions of our Association. Let's take a moment and look at its membership. It is composed of your president, the four vice presidents, the treasurer, the latest living past president, with the chairman of the Executive Committee on Research and your executive secretary as nonvoting members. It has been suggested that the Executive Committee be replaced by an expanded board of directors so as to introduce more Corporate Membership representation. On your Executive Committee the following firms are represented: American Viscose Corp; Ciba, Co, Inc; Corn Products Co; E I duPont de Nemours & Co, Inc, Laurel Soap Mfg Co, Inc; Phoenix Dye Works; and the University of Rhode Island in the academic field. Over the years I suspect that most, if not all, of our Corporate members will be represented on this Committee, as they are in the Council. I dare say that, if we were an association of companies rather than an individual membership society, the same individuals now serving would have been appointed by their firms to serve in AATCC.

It has been suggested that the Executive Committee be composed of management people. I can only say to this that each member of your Executive Committee for 1961 is not only a respected member of the management team of his company or university but is knowledgeable in the affairs of AATCC. In my judgment you have the "first team" working for you.

The second of these major executive groups is the Executive Committee on Research. Appointed by the Council, this committee is composed of a chairman, the chairman of the Technical Committee on Research, and six Senior Members. It is responsible for the general research policy and program of the Association. In my judgment, the chairman of the Executive Committee on Research has the most important job in our Association. Included in this group is the heart of the Association's activities as exemplified by the Technical Committee on Research and the ninety or so technical and reference committees composed of some five hundred volunteer technical and scientific workers giving unstintingly of their time and effort in the spirit of service and unselfish devotion to their Association and to their industry. Because of the extent of this activity, the wide variety of technical and research projects studied, and the simple fact that the research results are given free to the public, the greatest credit should be given to our Corporate Membership. These firms have not only contributed money, but even more generously contributed the time of their technical and scientific people and their facilities to make this work possible. It is certainly a tribute to the private enterprise system as we know it in the Free World.

The third and last of these three major groups is our full-time National Headquarters Staff, headed by our executive secretary. In a society of individual members engaged in furthering the objects of our Association, the job of our Headquarters' staff is to aid and equip the members to perform the work of AATCC and to furnish its committees with proper tools to keep the work moving forward, to provide an operational continuity for the Association in all its functions, and to serve as a communications center where information is developed, assembled and disseminated.

Our executive secretary sees the goal of our National Headquarters as simply to shape his organization to meet the specific needs of the Association as they emerge. He has expressed the view on numerous occasions that the Headquarters' staff should be completely subordinated to the membership, providing only such operational support of volunteer activities as is essential and otherwise unavailable.

I believe this corresponds generally to the attitude found in many individual membership societies where the role of the staff is to help the membership get their jobs done rather than do their jobs for them. It is safe to predict, however, as we continue to assume greater responsibilities, we will have to increase our reliance on our Headquarters group for specialized assistance. This means that, in strengthening our Headquarters organization when it becomes necessary, the goal will be to establish an arsenal which will provide sharp tools for the membership to work with.

At the risk of over-simplification, I have told you about the machinery we have to work with. It won't run itself, and how well it functions depends on the individuals who utilize it. With this kind of an organization, how can we use it to the best advantage? How high should we set our sights and how will we go about achieving our broad objectives?

These are not simple questions or easy to answer for several reasons. First of all, I might sum up these reasons by referring to a story our good friend, Hobart Souther, tells about a young man who was con-

sidering matrimony. He brought home girl after girl for parental inspection in particular for his mother's approval. In each case, no matter what sterling qualities the young lady had, his mother was unenthusiastic and vetoed his choice. Then he met a girl who looked like his mother, talked like his mother, walked like his mother and thought like his mother. With high hope he brought her home to meet his parents. His father didn't like her. So, you see, you can't please everybody.

In a society such as ours there can be 7,000 or more different opinions on some matters, and it is most improbable that we can ever get unanimous approval on everything or anything we do or don't do. However, through the democratic machinery and processes provided in our Constitution which have been so jealously guarded in our Association, the ultimate decision can be expected to reflect the will of the membership.

A few moments ago I indicated that in the past thirty-five years our Association has increased in membership approximately tenfold. I am sure you will agree with me that in the past three and one-half decades many other changes have taken place in the Textile Industry and in our own organization. I feel equally certain that were the founding fathers of AATCC here tonight they would take the lead in proposing and carrying through new ideas and methods to further our aims and objectives, for I am sure that they, too, recognized that "The Only Constant is *Change* Itself."

Our membership is highly diversified, occupationally, and the programs we undertake should be sufficiently broad to accomodate many and different phases of the science and technology of textiles. In fulfilling the immediate needs of our membership, we should not lose sight of long-range objectives which must be constantly kept before us in our thinking if we are to grow and render increasingly better service. At the same time it is incumbent upon us to contirbute our experience to new and related groups looking to AATCC for technical leadership.

We must give equal recognition to the problems of the dyer and the finisher in the mill as we should to the scientist in the laboratory. Nor should we neglect the needs of the technical service people whose requirements for information can be equally urgent and important.

There is a place for everyone in our industry in AATCC, and we must take care to serve these varied interests in a way that will not only make our membership in the Association meaningful but will also attract new members.

A study committee was formed in 1958 for the purpose of examining the present structure of our Association and preparing recommendations pertinent to future long-range objectives. This Committee was very carefully selected from members of AATCC who had distinguished themselves professionally and were knowledgeable of AATCC through many years of active membership. One of the members was your own Bob Bonnar, twelfth president of AATCC. This Committee in drawing up a blueprint for the future, as directed by the Council, consulted with many members of AATCC, and I believe that their report as accepted by the Council reflects as excellent a cross-section of thought as it would be possible to obtain. It is published in its entirety in the February 22, 1960 *Proceedings* and I commend it to you for a careful reading.

I am given to understand that it was not received in certain quarters with exactly "howls of joy," and I am very happy to learn this because it signifies that the report was read and has provoked thought by at least some of our members.

All of the recommendations of this Committee are compatible with our stated objects, aims and goals. We are in the process of taking action on those proposals that appear pracical at this time. Perhaps some of us are impatient for immediate action, but, in a society such as ours based on the principle of the democratic process, change occurs slowly and usually for the best when the decisions are made.

I would estimate that it might take several years before the entire spectrum of the Study Committee's thinking could be directly related to specific courses of action on all of the points covered. Furthermore, there will be changes and modifications of the original recommendations before final action is consummated. Finally, I feel confident that our initial thoughts and actions with respect to this report and others like it will change as the problems are resolved. Let me give you an example. The Study Committee recommended that AATCC "make provisions for active participation with a voice of influence in standards being developed by other agencies which bear directly on the performance characteristics of all textile and textile-like products."

As you all know, the Association's official position on the subject of standards was defined by President Helmus in his address to the Corporate Mill Member Luncheon in Atlanta on September 9, 1960, as published in the *Proceedings* on October 17th last, in which he stated, "Our business is the development of standard test methods—not performance standards." However, we must not forget that AATCC is recognized as the outstanding authority on test methods. As Charles Sylvester puts it—"These test methods are your yardstick of measurement which provides a common language between the sales department and the laboratory, the laboratory and production, the buyer and the seller." This could be very easily extended to the application of test methods as standards for consumer acceptance, and if AATCC, which is easily the best-informed technical body in the textile industry does not take on this function, some less-informed organization will fill this void. Now, I am not saying that I look with either favor or disfavor upon the Study Committee's recommendation. What I am saying is that I think this is but one example of a recommendation that was tabled that some time in the future will come up again. It is imperative that AATCC be alert and prepared to fulfill the needs of its industry—it is equally imperative that the membership of AATCC understand that, for their elected Councilors to vote intelligently, they need to know the thinking of the members.

One of the principal products of our Association is the written and spoken word. It is apparent that, having grown tenfold in size, and from membership in one country to an extension of our membership to forty-three other countries, there is a need to improve our communications. Deep concern by the Study Committee and other groups in AATCC has been expressed regarding our present system of publishing AATCC material. Various plans have been submitted and currently both the Executive Committee and the Executive Committee on Research are engaged in intense studies of the problem. There is a growing need for better facilities to achieve our goal for increasing the interchange of professional knowledge among our members. Certainly this aim is high on our priority list for 1961. We are

told we need a series of monographs and manuals for the technical man and the dyer and finisher. We are told that we need a scientific quarterly to reach the scientist and highly specialized members of our Association. Our *Technical Manual*—the most valuable book of its kind in the world today—increased by 150 pages in the past two years—soon, if this rate continues we will need jet engines on it to move it about. Our *Proceedings* need upgrading to make our published material of at least equal quality to that of similar societies. All of these things cost money.

In the field of color, AATCC holds a respected and authoritative position. The *Colour Index*, the most up-to-date and thoroughly complete documentary of its kind, carries the AATCC name throughout the world. Our *Technical Manual* is a standard reference on this subject. Should we confine ourselves to textile coloring or are we to be concerned with the science and technology of color as applicable to all material? Incidentally, to the layman what is a textile material today? Despite some reluctance to widen our horizons, demands are being made upon us to recognize those groups which need to draw on our experience. If we accept the principle that changes come with the elapse of time, then we must inevitably accept the principle that color is our business. The Study Committee recommended that AATCC broaden its base to accommodate all those interests which are concerned with the science and technology of color. While this recommendation is very broad, the principle is such that it requires serious consideration by the Executive Committee and the Council. I would make the observation that it has been my experience that, when a firm is involved in color problems of almost any kind, they either employ or seek out an AATCC member in order to secure competent assistance.

I have but touched on a very few of the sixteen recommendations made by the Study Committee on Long-Range Objectives. Others will certainly occur to you, and, indeed, all of the aims and objectives are not limited to the sixteen proposed by the Study Committee. Let me now suggest some concrete actions you and I as individual members of AATCC can take singly and collectively.

We must do everything we can to stimulate research both within the structure of our Association and in the companies of our industry. As an industry we are not noted for the amount of money we spend on research. Our Association can furnish inspiration and leadership through its facilities for mobilizing a more effective industry-wide effort in practical textile research from which both short-range and long-range returns can be expected.

It will not be difficult for you to find support in this undertaking—it may be difficult to sell your ideas without help. The technical authority of AATCC is recognized and known and the Association has the machinery capable of bringing together experts of many capabilities to study the problems of today and tomorrow.

In this connection I want to again say that it is the combined talents of all our members which will enable us to progress—not merely a handful of dedicated volunteers who are willing to work. On this note I would also say to you that I hope that I don't hear any complaints about not being invited to serve on an AATCC Committee. Believe me, there are jobs for everyone, and anyone who wants to join in our undertaking has only to let me know and I will see to it that he has a committee appointment.

Another concrete action that you can take is to participate in securing new individual and corporate memberships. On this point I want to pay tribute to your own Herbert Stauderman for handling so superbly the Individual Membership campaign. Help me keep him interested and active in his capacity as chairman again this year. How do you go about getting new members? Simple—you get an application blank from Herb or George Paine and you tell your story to one of your friends or associates in the industry. One call—one sale, and the satisfaction of helping your Association.

To the man or woman that you get to join AATCC you can rest assured that they will soon find out that no matter what gain a member experiences in enriching his technical knowledge, it is bound to increase his value to his employer. Our Corporate Members recognize this and many a company is directly benefitted in proportion to AATCC participation by its employees. In this kind of a game everybody wins!

A third concrete action that you can take is to keep your Councilors and officers of AATCC informed of your thinking about AATCC affairs. Talk to them—write to them. It will pay you dividends. Ideas are just as welcome as volunteers. If you feel that there is something AATCC should be doing, some research area or project that should be explored, or some program that should be developed, please don't keep it a secret! I want to repeat that yours is an Association of individual members, and that each member should look upon AATCC as the place where he can feel free to express himself professionally.

In discussing the general subject of aims and objectives, it is very easy to create a drab sort of picture about our Association. This is far from my mission and it is equally far from the truth. The truth is that your Association is in a very enviable position. We are not only in a sound position financially but we live within our income. We are fortunate in having a well-defined set of objectives and a house that is in order.

We enjoy the largest number of members in our history. Our major committees are, or will shortly be, equipped with sound operating manuals. Our *Technical Manual*, and the *Colour Index* which we published jointly with the Society of Dyers and Colourists, are the basic references in their fields. We have more research and technical committees operating on an active basis than ever before in our history. We have successfully come through and proved over a two-year period that we could undergo reorganization of our administrative activities. We cooperate with more associations and societies with whom we share common interests than ever before in the United States. In the international field we are acknowledged as the most powerful organization of textile chemists and colorists in the world. We have learned to travel—our members, accredited as AATCC representatives, are meeting more often than ever before with representatives of other societies. We are the authority on test methods in the United States in our field. Our test methods and instruments are adapted by many other groups to their special purposes.

I am sure I could go on in this vein for a long time. But AATCC has much to acclaim it as a potent force in the world of textile technology and its dedicated men and women as well as its achievements of record. In analyzing our aims and objectives we do so to make our Association even better equipped to meet the problems facing it forty years after its founding.

Thank you all for your warm reception and courteous attention.

• ACTIVITIES OF THE LOCAL SECTIONS •

Pacific Southwest

PACIFIC SOUTHWEST SECTION held its final dinner meeting of the year on November 18 at the Rodger Young Auditorium, Los Angeles, Calif, with 39 members and guests in attendance. Chairman Walter E Kramer, Jenkins Wright Co, Inc, opened the meeting by introducing guests in attendance at the Section's "Guest Night".

Speaker of the evening was Prof Edna Meshke, University of California at Santa Barbara, who spoke on the subject "The Effect of Weft Yarn Twist Upon the Properties of Cotton Fabrics Before and After Resin Treatment". A brief question-and-answer period followed the talk.

Those in attendance also were shown a film dealing with reactive dyes.

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Southeastern

FOLLOWING is a set of notes compiled by Warren E Tiller, secretary, Southeastern Section, on the presentation made by Henry E Millson, American Cyanamid Co, at the December 3 meeting of the Section at the Atlanta Athletic Club, Atlanta, Ga. These have been edited by Dr Millson, whose subject was entitled "Microscopic Studies of Dyeing Processes Using Various Fibers and Dyes".

"The art of dyeing is now becoming more scientific as we learn more about what happens on the surface and within the fibers as dyes are applied. Current studies on this subject indicate a great future in the textile industry in the field of dyeing.

"Metallic ions play a great part. Stainless-steel machinery, wherein the dyeing processes are carried out, is good. However, the feeding of water and steam through iron pipes introduces metallic ions which may result in faults. It is noted that one ppm of iron ions, for example, results in noticeable faults in the uniformity of dyeing.

"The liquor ratio is important. It is noted that if 10 times more water is used in the dyebath, then 10 times more ions would be introduced. Similarly, if five baths are used, each bath increases the amount of metallic ions that would be present to cause the faults. (Samples were shown to demonstrate the effects of liquor ratio.)

"Lightfastness is needed now more than ever in fabrics being produced by the textile mills, particularly for such industries as the automobile industry where the specifications for lightfastness are very demanding. Moisture plays a great part in lightfastness. Samples subjected to exposure with water present fade almost to destruction, while the dried samples fade little, if any. An atmosphere of oxygen accelerates fading while carbon dioxide retards the rate of fading with certain fibers.

"Samples were exhibited of vat-dyed blues on cotton, a fast color. One sample with one drop of water added and subjected then to 17 days' exposure faded to destruction, while bone dry samples under the same conditions did not fade excessively during 56 days exposure.

"Tendering of cotton and rayon results on exposure and it is noted that some dyes are drawn to the surface of the fibers and this apparently causes some fiber destruction. Migration of pigments from inside the fiber to the outside surfaces is being further investigated to confirm this theory. It is noted samples exposed in an atmosphere of argon causes a change in shade on cotton and rayon dyed with vat violet. The reason for this is unknown.

"Other studies described by Dr Millson were made of direct-dyed and vat-dyed materials to determine fastness to light. What is done following the dyeing process effects the fastness. Samples were exhibited showing the effects of aftertreatment following the dyeing process and samples were also shown of materials dyed and aftertreated with fixing agents. Aftertreatment affects the fastness of the dyes in that it reduces the fastness to light and increases the fastness to water bleeding. pH may also affect the fastness properties.

"A recent discovery showed that, in seashore lighfastness testing, the backs of exposed fabrics also fade, sometimes severely. In some experiments 20 layers of nylon fabric were used in Fade-Ometer tests and fading occurred on the bottom swatch.

"Discoveries with direct dyes have been made recently with regard to the time the material is boiled during the dyeing cycle. It was noted that boiling for one hour shows relatively little effect, but boiling for five hours may cause considerable decomposition of certain dyes. Some dyes are highly resistant to the effect of boiling, while others become progressively stronger in shade on prolonged boiling. In the case of combination shades, where red, yellow and blue dyes are used, for example, on the same fabric, continued boiling may change the shade drastically. Dr Millson referred to a table which shows the effect of boiling on a large number of direct dyes. Studies have been made to inhibit the decomposition and shade change as a result of boiling. It was noted that 5% ammonium thiocyanate stabilizes dyes and gives better shade control in the dyeing process. This material may make it possible to reduce the time at the boil which is now required to get a certain shade.

"Fastness to crocking is a subject which Dr Millson further described. Dyes that go into the fiber itself may come out of the fiber in the dyeing cycle. Samples were shown to demonstrate this phenomenon in the case of a certain chrome lemon if sulfuric acid is used for exhaustion. A shade change will occur and fastness to crocking is reduced—the reason being that sulfuric acid will cause the dye to come back out of the fiber. The remedy in the case shown by Dr Millson is to use ammonia to hold the shade and to give fastness as well as afford exhaustion.

"Dr Millson showed color slides demonstrating how dyes migrate into and out of the fibers under certain conditions. Also Dr Millson showed the audience a time-lapse Kodachrome motion picture dramatically showing how dyes migrate into and out of a wool fiber under various conditions.

"Dr Millson held a question-and-answer period following the presentation."

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Mid-West

THE Fall, 1960 meeting of the Mid-West Section was held at the Bismarck Hotel, Chicago, Ill, on October 29.

Speakers at the afternoon session, which was attended by 78 members and guests, was Samuel Helfand, Technical Service Dept, James River Div, Dow Chemical Co. Mr Helfand, who was introduced by J Gordon Stott, spoke on "The Dyeing of Zefran Acrylic Fiber in Blends."

During the business session in the afternoon, the appointment of Louis Haine and Bernard Faye as chairman and cochairman, respectively, of

the Outing Committee was announced.

Ernest Larrat Jr, chairman of the Technical Committee, reported that the Section will be represented with a paper at the 1961 Intersectional Contest.

John Eich, for the Nominating Committee, placed a slate of officers in nomination. The following were elected unanimously to serve for 1961: *Chairman*—James L McGowan; *Vice Chairman*—Frank S Stover; *Treasurer*—James E Miller; *Secretary*—Arthur J Andrews; *Councilors*—Alfred J Olson, Jack G Kelley, and William Fischer; *Sectional Committee*—Paul D'Armour, Kenneth J Giese, Chalmer E Worley, and Glenn Templeton.

An invitation will be extended to the National Council to meet in Chicago in November.

Dinner was served to 97 members and guests, following which Chairman McGowan made a surprise presentation to Past Chairman Stott of an engraved silver tray for long and faithful service to the Association and to the Section.

Guest speaker at the dinner was G Herbert True, who spoke on the subject, "Is Middle Management Doomed?"

(*See photographs on page 25 of December 26 issue*)

Northern New England Section Annual Meeting
December 9, 1960 • Colonial Country Club, Lynnfield, Mass

(See report on pages 44-5 of January 23 issue)

(Photos by L E Rossiter, Nopco Chemical Co)

NNE Sectional Committeemen for 1961, l to r: Daniel Frishman, Malden Spinning & Dyeing Co; John J McDonald, Lowell Technological Inst; Harold Stenlund, The Felters Co; and Bennett S Gesmer, Dyecraftsmen, Inc

Frank J Rizzo, QM R&D Command, newly elected NNE vice chairman (right); and Edward J McNamara Jr, Hamilton Chemical Corp, newly elected NNE chairman

Robert D Robinson, Bachmann Uxbridge Co, retiring NNE chairman

Ernest L Kaswell, Fabric Research Laboratories, Inc, presented selections of the Nominating Committee

William I Kent, Kent Mfg Co, guest speaker at Dec 9 meeting

Newly elected NNE Councilors, l to r: John J O'Neil Jr, Soluol Chemical Co, Inc; Robert D Robinson, Bachmann Uxbridge Co; and Donald H Thomas, National Aniline Div

L to r: Willim W Pennock, E I duPont de Nemours & Co, Inc, NNE treasurer; William I Kent, Kent Mfg Co, guest speaker at Dec 9 meeting; and Robert D Robinson, Bachmann Uxbridge Co, who served as NNE chairman for the last time.

Membership Applications

January 5-11

NEW ENGLAND REGION

Northern New England Section

Senior

Theodore D Forman Jr—Part time sales rep, part sales & mill mgr, J W Wood Elastic Web Co, Stoughton, Mass. Sponsors. G J Mandikos, G M Kidder.

CENTRAL ATLANTIC REGION

Metropolitan Section

Senior

John F Gellene—Technical sales, Refined Products Corp, Lyndhurst, NJ. Sponsors: D M Musser, S J Van Haste.

Niagara Frontier Section

Associate

Paul M Rooney—Librarian, Buffalo & Erie County Public Library, Buffalo, NY.

Delaware Valley Section

Senior

Philo D Atwood—Tex branches of Du Pont Co, currently mgr of fabric dev, E I du Pont de Nemours & Co, Wilmington, Del. Sponsors: S W Brainard, O J Lutness.

SOUTHERN REGION

Washington Section

Junior

Henrietta C Jennings — Textile chemist, Naional Bureau of Standards, Washington, DC, Sponsors: J M Blandford, D E King.

Piedmont Section

Junior

George C Holland—Asst dyer, Lenoir Hosiery Mills Inc, Lenoir, NC. Sponsors: H C Reese, Jr W S Truette.

Northern Piedmont Section

Junior

Alton D Rickman — Dyer, Old Dominion Finishing Co, Div Burlington Ind, Altavista, Va. Sponsors: B F Rivers, S G Williams.

South Carolina Section

Senior

Harold O Bryant Jr—Overseer of dyeing, Amerotron Co, Barnwell, SC. Sponsors: W S Myers, J W Stallings.

Southeastern Section

Senior

Richard L Arceneaux—Chemist, Southern Utilization Res & Dev Div, Agri Res Service, USDA, New Orleans, La. Sponsors: R M Reinhardt, L W Mazzeno Jr.

Carroll L Hoffpauir—Asst dir, program dev, Southern Utilization Res & Dev Div, Agri Res Service, USDA, New Orleans, La. Sponsors: L W Mazzeno Jr, W A Reeves.

WESTERN REGION

Pacific Northwest Section

Associate

Joseph B Durra—Mgr, chemicals dept, Getz Bros & Co, San Francisco, Calif.

NOT AFFILIATED WITH A SECTION

Senior

Lucien H Marcou—Direction des produits de Synthese, Compagnie Francaise Des Matières Colorantes, Paris, France. Sponsors: J H Firpo, H A Des Marais.

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January 12-18

NEW ENGLAND REGION

Northern New England Section

Senior

Paul J Angelo Jr—Tech dir, Res & Dev Div, Lowell Technological Institute Research Foundation, Lowell, Mass. Sponsors: E J McNamara Jr, J P Ploubides.

Anthony D Fernandez—Res & dev of pile fabrics, Malden Limited, Lawrence, Mass. Sponsors: E J McNamara Jr, H A Freedman.

Associate

Harry D Sentkowski—Pres, sales mgr, Tanners Dye & Chem Corp, Peabody, Mass.

CENTRAL ATLANTIC REGION

Metropolitan Section

Associate

Philip Rubin—Sales mgr, Milpac Dyeing Co Inc, Brooklyn, NY.

Delaware Valley Section

Transfer to Senior

Robert M Bateman—Marketing & sales textile chemicals, Atlas Powder Co, Wilmington, Del. Sponsors: A M Viditz-Ward, H H Parkinson.

Ronald L Depoe—Asst to head dyeing & finishing div, American Viscose Corp, Tech & Textile Service Dept, Marcus Hook, Pa. Sponsors: W S Sollenberger, I H Welch Jr.

SOUTHERN REGION

Piedmont Section

Senior

Charles V Tallman—Dev supv, U S Rubber Co, Lastex plant, Gastonia, NC. N A Truslow, H A Des Marais.

Northern Piedmont Section

Senior

Charles E Boger Jr—Manufacturer's agent representing several companies, Concord, NC. Sponsors: F H S McCoy, A H Gaede.

Transfer to Associate

William Conn—Textile chemist, Union Carbide Chemicals Co, So Charleston, W Va. Sponsors: H A Rutherford, H Y Jennings.

South Carolina Section

Junior

Lexie D Walters—Now on training program, J P Stevens & Co, Delta Finishing Div, Wallace, SC. Sponsors: H G Parrish, J R Hendricks.

Southeastern Section

Senior

Austin L Bullock—Associate chemist, Southern Regional Res Lab, New Orleans, La. Sponsors: G L Drake Jr, J D Guthrie.

STUDENT CHAPTER

North Carolina State College

Student

Bahaa E D Raafat—Student, North Carolina State College, Raleigh, NC. Sponsor: H A Rutherford.

NOT AFFLIATED WITH A SECTION

Senior

Karl Neufang—Chemist & colorist, Farbenfabriken Bayer, Leverkusen, Germany (West). Sponsors: W Kass, W L Swenson.

Associate

Carlos M Marquez—Production mgr, Atoyac Textile "SA", La Esperanza, Puebla, Pue, Mexico.

AATCC Deceased

Member	*Section*
NELS R HANSEN 1545 Dana Pl Orange, Calif	PSW
JOHN M HOOD Cooleemee, NC	Pied

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks may be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

61-1

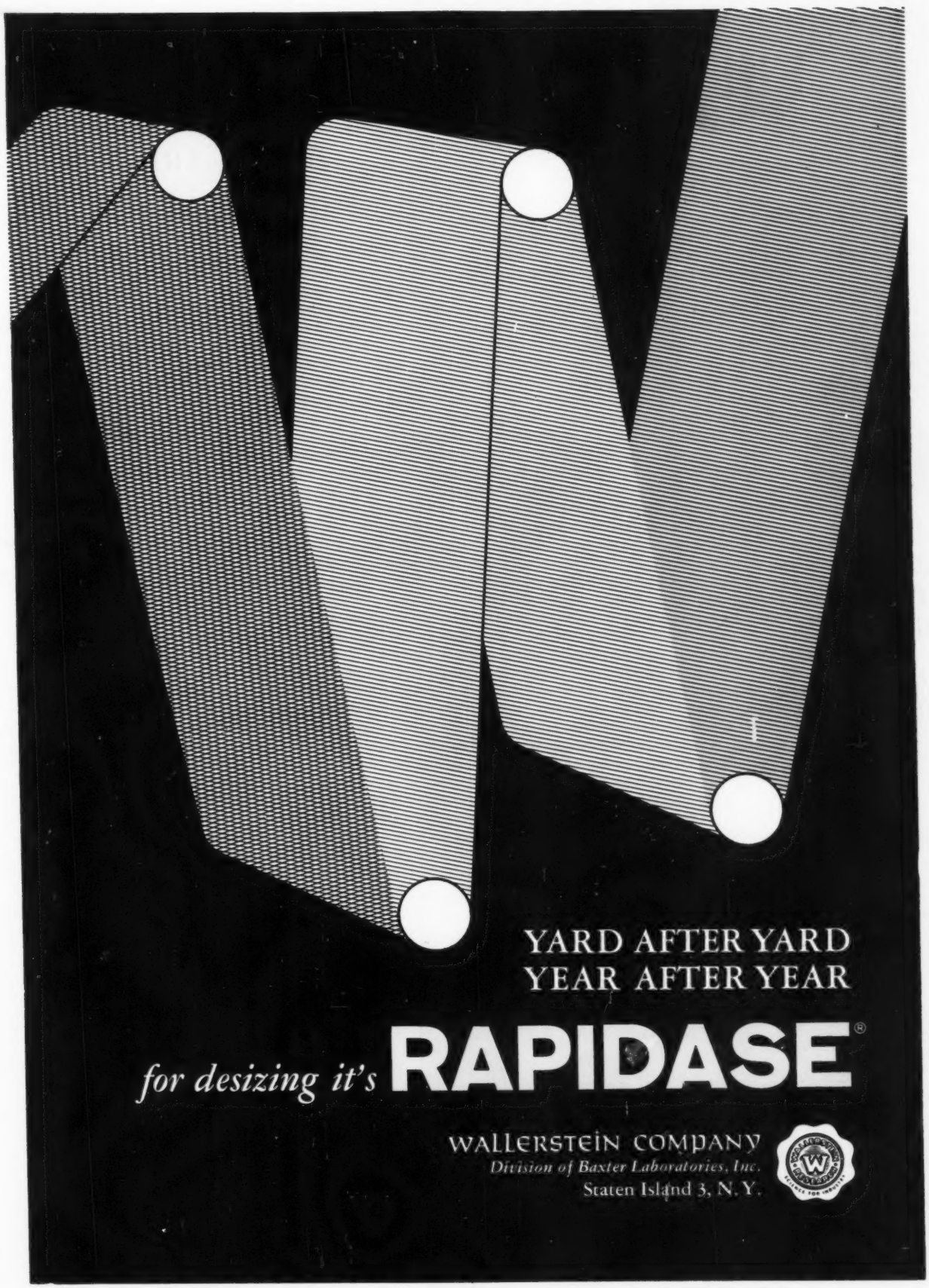
Education: BS, organic chem & textiles.
Position desired: Textile chemistry research, quality control or analytical chemist.
Location: Anywhere.
Age: 32; single; references.

2-6, 2-20

61-2

Education: High school; evening certificate, LTI.
Position desired: Head dyer.
Location: New England, Metropolitan NJ area.
Age: 46; married; one dependent; references.

2-6, 2-20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TERGITOL nonionics have proved effective in scouring, bleaching, and carbonizing compounds used by the textile industry. As detergents, they speed dishwashing, laundering, dry cleaning. They give good pigment dispersion, flow-out, and stability to latex paints. Metal cleaners, leather dressings, silicone preparations, shampoos, adhesives, bactericides—all can be improved with TERGITOL nonionics.

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NP-27	20
TP-9	51-56
NPX	60-65
NP-35	90-95
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XD	60-65
XH	90-100

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VAT DYE PRINTS
Thickened with Resin-containing W-I-O Emulsion (D,2,01)

U S Pat 2,907,624 (DuPont — Saville — Oct 6, 1959)

According to this patent, a vat dye is suspended in the aqueous phase of a water-in-oil emulsion in which an oil-soluble or oil-dispersible resin has been emulsified. This vat dye paste is printed on textile material from shallow engraved intaglio rolls. The fabric is dried as usual and then impregnated by padding with the conventional reducing liquor of caustic and sodium hydrosulfite and immediately steamed in an air-free ager at 212-290°F for seven to 30 seconds. By oxidizing and soaping, the shade is developed as usual while residues of the resin are removed at the same time.

Thus the resins contained in the paste act as *temorary binders*, only somewhat like standard thickeners but obviously offering better adhesion during the processing stages. Alkyd resins, eg, Duraplex A-27, a cotton-seed-oil-modified product, are preferred in this method, but other resin classes may be used as well (cf col 3, line 65 to col 4, line 18). Prints are claimed to be sharp in outlines, smooth and outstanding in strength and brightness.

Example: A xylene solution of Duraplex A-27 is colloidally dispersed in Varsol #2. Thirty-five parts of this dispersion are emulsified at high speed with 65 parts of water . Ten parts of a vat dye paste (CI Vat Blue 16-CI 71,200) are finally added to 90 parts of the resin-containing w-i-o emulsion. A cotton muslin fabric printed with the above paste is dried on hot cans for one to five minutes at 220-275°F; then padded within "a fraction of a second" in a bath containing caustic, hydrosulfite, a surfactant and some alkali-compatible starch; aged; re-oxidized with H_2O_2 + acetic acid; scoured; rinsed and dried. The tinctorial value of the prints reportedly was found to be even somewhat higher than that obtained when conventional aqueous pastes based on a starch-sodium alginate thickener were applied.

Among references cited by the Patent Office:

U S Pat 2,288,261 (Interchem Corp/1942): a vat dye printing paste of the w-i-o type contains vat dye and reducing ingredients in the aqueous phase and sufficient lecithin to prevent flushing of the color in the continuous lacquer phase.

U S Pat 2,594,899 (Am Cyanamid/1952): a w-i-o emulsion used in a vat-dye printing paste consists of an oily phase of drying-oil-modified alkyd resin dissolved in a hydrocarbon solvent, and an aqueous phase containing sodium-lignin sulfonate plus the usual reducing agents in alkaline solution. [Cf *Am Dyestuff Reptr 41*, 627 (1952)].

•

STIFF FINISHES ON NYLON FABRICS——— Acrylic Acid Polymer plus Polyhydric Alcohol (G,2,01)

U S Pat 2,899,341 (ICI — Dawson — Aug 11, 1959)

According to the preamble to this specification, it has been suggested in the past that stiff finishes be imparted to nylon by the application of aqueous solutions of polyacrylic acid and heat to insolubilize the finish. In order to avoid corrosion of metal parts of the equipment by those strongly acid solutions, it has been advocated that the solutions be partly neutralized, but no fixation of the finish reportedly can be obtained beyond 25% neutralization.

The finishing process protected by the current patent calls for application of the ammonium salt of an acrylic acid polymer plus a polyhydric alcohol, optionally in the presence of an acid catalyst.

Suitable polyacrylic acids to be used in this process are those which form solutions of viscosities between 10-250 cp (pref 15-50 cp) at 20°C when 50 g of the polymer are dissolved in sufficient 2n NH_4OH to give one liter of solution.

Suggested polyhydric alcohols include, among others, diethylene glycol, glycerol, etc. Ammonium salts and amine salts of inorganic acids (col 2, lines 14-20) may be used as latent catalysts.

Nylon fabrics are padded in these solutions, dried and heated to 150-220°C for 10 seconds to 30 minutes. Nondyed nylon goods impregnated with solutions of this type were found to acquire affinity for basic and onium dyes.

Example: Nylon twill fabric was passed through a solution which contained the ammonium salt of 4.5 p of an acrylic polymer and 1.5 p glycerine in 94 p water, squeezed to a wet pick-up of 76%, dried at 50°C and baked for 30 minutes at 150°C. A stiff finish which resisted a fifteen-minute drycleaning in white spirit reportedly resulted.

The presence of an acidic catalyst was found to increase the stiffening effect and to improve the durability of the fabric (col 2, lines 54-56).

Among the references cited by the Patent Office:

U S Pat 2,692,182 (Rohm & Haas/1954): nylon fabrics or fibers are impregnated with solutions of polyacrylic acid and glycerine and heated up to 425°F to obtain a durable finish. [Cf *Am Dyestuff Reptr* 45, 184 (1956)].

U S Pat 2,807,865 (Rohm & Haas/1957): water-soluble or -dispersible ammonium or alkali salts of certain acrylic acid polymers (containing five to 20 mole % acrylic acid) were found to be appropriate sizes for artificial hydrophobic fibers.

•

FIRE-RETARDANT COMPOSITION——— Reaction Products of Polyamines and Mineral Acids, Insolubilized with Organic Acids (G,2,03)

U S Pat 2,900,279 (Dow Chemical Co — Dreisbach, Lang — Aug 18, 1959)

The current invention is designed to avoid disadvantages that frequently occur in flameproofing processes, such as hardness and brittleness of the treated goods and tendering of the fibers, which limit their usefulness. This reportedly is accomplished by the immersion of cellulosic goods in an aqueous solution of a condensate of a polyamine with phosphoric or boric acids (which are in themselves known flame retardants) and the insolubilization of the reaction products by a treatment with an organic acid, eg, acetic or oxalic acid or 2-4-dibromo succinic acid.

The alkylene polyamines must contain more than one free NH_2- group and form water-soluble salts with the above-mentioned inorganic acids. Examples are ethylene diamine, diethylene triamine, and so on. The reactants should be employed at a ratio of one:one mol. In this event, functional reactive groups remain in the

amine salt, which may be reacted further with one of the above-mentioned organic acids. Acetic acid serves to insolubilize the reaction product in the fiber, oxalic acid will cross-link two molecules of the condensate, and dibromo succinic acid will not only act as a cross-linking agent but also introduce halogen atoms into the finish.

Example: A cotton sheeting was immersed in a 24% solution of the reaction product of one mol diethylene triamine with one mol H_3PO_4, then removed and drained dry. Thereupon the fabric was introduced into an aqueous acetic acid solution and dried. The sheet was exposed to a flame and found to be self-extinguishing without showing any afterglow.

Among the references cited by the Patent Office:

U S Pat 2,286,726 (DuPont/1942): cloth is treated with an aqueous ethylene imine solution, then after-treated with a fire retardant of acidic character, such as H_3PO_4. Durable flame-retardant finishes are claimed.

U S Pat 2,408,332 (Arnold, Hoffman/1946): condensates of boric acid with amino compounds are used for sizing textile yarns. Hard, glossy resins are formed.

ADR ABSTRACTS

Some Physical Properties of Chemically Finished Viscose Rayon Filament Yarns and Fabrics

Morton, D H and Beaumont, C, *J Soc Dyers Col* 76, 578-83, Oct, 1960

The physical properties of viscose rayon filament yarns have been studied by the authors both before and after treatment with a wide range of resin and formaldehyde finishes applied by normal, as well as unconventional, methods. The principal resins used were urea- and melamine-formaldehyde and dimethylol ethyleneurea.

Among the effects of treating viscose rayon with these various finishes, the following are stressed by the authors as being of importance with regard to the ultimate fabric properties:

1) A reduction in water imbibition and hence of fiber swelling. (This contributes to improvement in dimensional stability of the fabric.)

2) An increase in dry tensile elastic recovery.

3) "Setting" of crimp and relaxing strains in the yarns when the resin treatment is carried out on the fabric in the piece.

4) An increase in the wet initial modulus of the fiber. (This, the authors suggest, must improve both resistance to formation of creases and the forces of recovery. Resin treatment achieves this without reduction in the tensile elastic recovery available.)

5) A sharp reduction in yarn breaking extension. (This is the factor limiting the quantity of resin which can be applied. Low extensibility, and hence low work of rupture, leads to fabrics of low tear- and seam-strength, low resistance to abrasion, and poor sewability. The situation is made much worse by any sticking together of filaments by resin owing to faulty or excessive application. This cannot happen with acid formaldehyde treatments, for example, and these yield fabrics of relatively fair tear strength at a given level of yarn extensibility, the authors state.)

It is thus clear, they conclude, that a major part of the art of resin finishing on fabrics made from normal viscose rayon is that of striking a compromise for any particular fabric construction between the amount of improvement needed in the properties of tensile elastic recovery, imbibition and wet modulus, and the amount of reduction in extensibility which can be tolerated without degrading the wear properties of the fabric too far.

It is pointed out that for the same degree of modification of yarn properties, different quantities of the different types of resin are needed, and quite small quantities of formaldehyde have the same effect on yarn tensile properties as large quantities of resin. Thus the choice of chemical finish must be based on considerations of fastness requirements, ease of application, ease of control, whether it is required to add weight to the fabric (which is not done by the formaldehyde treatment) and the fabric hand required.

The experimental work is described in detail, and is illustrated by numerous curves. Sixteen references to the literature are cited.

Cotton: Improving its Properties Spurs Demand for Chemicals

M:Cord, F A and Getchell, N F, *Chem & Eng News* 38, 106-10, Nov 14, 1960

Cotton products are now being made at a rate of more than ten billion yards annually. Research possibilities for finding new chemical treatments for these products are tremendous. Last year over 1.9 billion yards of cotton fabrics were treated with chemicals to give them wash-wear qualities.

Wash-wear is the initial development of a wide range of improved properties than may be added to cotton through research in chemical finishing. These other properties include warmth, luster, soil resistance, and higher tensile strength.

The original research leading to the present wash-wear finishes dates back to the late 1920s, when it was found that treating cellulose fabrics with urea-formaldehyde resins made them more resilient and wrinkle-resistant. These early treatments were incorrectly (according to the authors) referred to as "resin finishes"; in recent years most research workers have decided that wrinkle resistance comes from an internal chemical cross-linking of adjacent chains in the cellulose fiber rather than from resin formation in the fiber or on its surface.

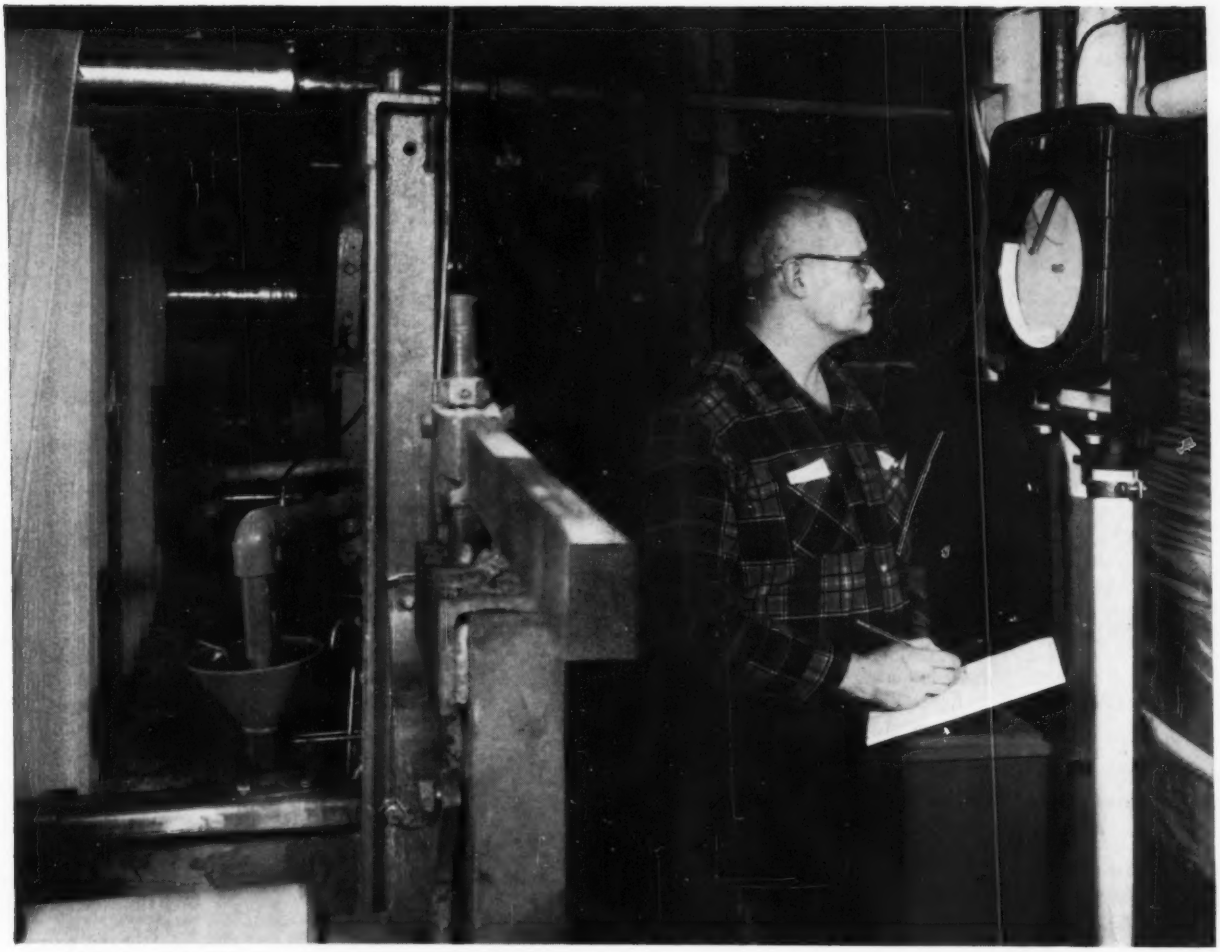
Laboratories are now turning out a steady stream of improvements over the earlier chemicals. Melamine-formaldehyde precondensates, an improvement over urea-formaldehyde products, were introduced shortly after World War II. The cyclic ureas followed in the early 1950s. Now, one of the most commonly used of the cyclic ureas is dimethylol ethylene urea.

In recent years several new types of cellulose-reactant creaseproofing chemicals have made their appearance, including acetals, epoxides, triazones, modified triazines, quaternary ammonium derivatives of bis-chloro-methyl ethers, and divinyl sulfone derivatives. Each of these is said to offer improved creaseproofing properties over formerly used compounds, particularly with white fabrics.

Wash-wear cottons are rapidly replacing untreated cottons in many large uses. Men's sport shirts appear to be the largest single apparel market for these fabrics.

Despite 40 years of stiff competition from rayon and 15 years from the newer synthetics, cotton continues to command by far the largest single market for all fibers and competing materials.

The authors close with a brief description of the creaseproofing process as applied to cotton fabrics.



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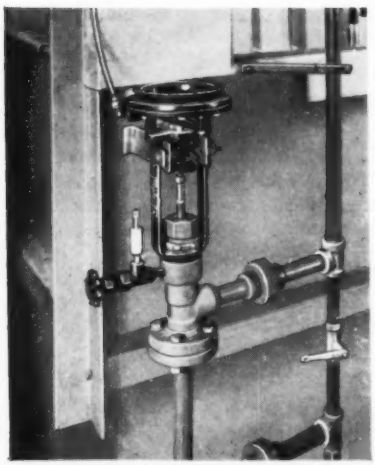

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New Horizons for Pigment Dyeing

Cassel, N S, *Can Textile J* 77, 45-8, 51-2, Oct 28, 1960

Pigment dyeing employs the conventional pad-dye equipment. It involves immersion of the fabric in the pad liquor, expression of the excess, drying and curing.

The pad liquor differs from soluble dyestuffs in that it is a dispersed system. It can be an oil-in-water emulsion, a water-in-oil emulsion, or an organic, solvent-free system consisting of a dispersion of pigment, resins and auxiliaries in water.

Since all three types involve physical chemistry in the aspects of wetting, dispersion, rheology, expression, migration and drying, it has been necessary to study these basic concepts and relationships. As progress has been made in gaining a more accurate understanding, new concepts have evolved which the author believes will widen the horizon of pigment dyeing. These concepts are discussed at considerable length.

When we make an emulsion, in a sense we are trying to make two immiscible liquids miscible. If we want an oil-in-water emulsion, we add an agent to the water which reduces its surface tension. When the oil and water plus this agent are agitated, the oil is broken up into tiny globules, and the water surrounds each oil globule. If, however, we want a water-in-oil emulsion, we dissolve in the oil a polymer which has a polar group (eg, ethyl cellulose or an alkyd resin). A small amount of salt is added to the water to increase its polarity. The polar groups of the alkyd resin added to the oil enable it to "wet" the water. On stirring, the water globules become dispersed in the oil.

In dyeing dress goods, shirtings, etc, the oil-in-water type of emulsion is generally used. In tentage, tarpaulins, etc, where organic waterproofing is required, the water-in-oil method is preferred.

It is vital that the pigment be well dispersed and stay so. In order to ensure good dispersion and to prevent flocculation, the pigment must be wet by the binder.

The author discusses the mechanism of crocking, and states that the crockfastness of pigment colors, which has been poor in the past, can be much improved by the use of nitrile rubber latices, added to the water phase of water-in-oil emulsions.

He makes the following recommendations:

1) For washfastness, the resin binder must have polar groups which give strong bonds of adhesion to the fibers of the fabrics being dyed.

2) The binder must retain, after curing, the necessary elastomeric properties which reduce crocking to a minimum.

3) The binder must be capable of reacting in such a way that the polar groups are tied up and thus lose their water sensitivity.

4) Any auxilary materials added to the dye liquor must have polar groups that can be similarly tied up.

5) A cross-linking agent should be present, to tie up all water-sensitive groups. Preferably it should also cross-link with the fiber. Such a reactor, the author says, has now been developed.

●

Weathering of Textile Yarns

Fels, M, *J Textile Inst* 51, P648-56, Nov, 1960

A weathering test of various natural and synthetic yarns was conducted in 1955-6 in two different locations: Kano, Nigeria, and Didcot, England. The fibers exposed were bright and semidull Orlon; bright high-tenacity, bright and dull nylon; bright and dull Terylene; high-tenacity, bright and dull viscose; bright and dull acetate; bright and dull triacetate; cotton; and wool. For each exposure the yarn was wound on an aluminum alloy frame. Full details of the exposure technique are given.

The exposed yarns were later conditioned and tested for tensile strength on the Goodbrand machine. The results are tabulated.

The Orlon yarn, both bright and dull, was found to have a much better resistance to weathering than any of the other fibers tested. The dull Orlon was not much inferior to the bright type.

Under tropical conditions (hot, dry) there appears to be little to choose between nylon and Terylene. Although the rate of degradation of Terylene was slower than that of nylon yarns of normal tenacity, there was little difference in actual strengths after exposure, since the initial strength of the nylon yarns was at least 20% higher than that of Terylene. High-tenacity nylon had a very high initial strength; on exposure it lost strength rapidly at Kano, but at both Kano and Didcot its actual retained strength remained higher than any of the other fibers except Orlon.

All cellulosic yarns had much lower initial tenacities, so that, even where the rate of degradation was comparatively slow, the actual strengths of these fibers remained lower than those of the synthetic fibers. The initial strength of high-tenacity viscose was high, but it deteriorated fairly rapidly on exposure.

The bright and dull normal-tenacity viscose had higher initial tenacities than the acetate yarns, but the rate of degradation of both types of acetate was comparatively slow (at Kano).

The triacetate yarns were the weakest to be included in the trial, and both the bright and dull yarns lost strength fairly rapidly.

The rate of loss of strength of cotton was slow compared with the other cellulosic fibers and, bearing in mind its high wet strength, there is little reason, the author says, why any of the manufactured cellulosic fibers should be preferred to it for fabrics exposed to the weather, except possibly on economic grounds.

The behavior of wool differed at the two sites. At Didcot it retained a higher proportion of its strength than all other fibers except dull and bright Orlon and bright Terylene, but at Kano it lost strength very rapidly.

●

Advantages of Using Gas-fired Equipment in the Finishing and Drying of Textiles

Andrews, B R, *Textile Bull* 86, 71-2, Nov, 1960

When gas became available to textile finishing plants as a source of heat for processing, its cost was found to compare favorably with coal or oil, even though the fuel price per BTU was higher. This is true because:

1) There are no stand-by losses of heat when a gas-fired unit is shut down, as there are when steam is used and long runs of steam pipes and condensate returns remain hot, or perhaps steam is left on in the unit all the time.

2) The investment in gas mains, regulating valves, etc, is only a small fraction of the cost of a steam-generating plant of like BTU capacity. Even if standby storage tanks for liquid gas are required, the investment is still much less.

3) Some processing equipment, eg, dryers and curers, can be operated at higher temperatures than may be obtained with steam pressures available in most plants. Consequently the capacity of these units improves considerably, or the same capacity can be achieved

with smaller equipment. This means a lower cost per yard of cloth.

4) An added saving comes from the fact that overheating and overdrying of the fabric is avoided, paricularly when ranges are stopped, since temperatures can be regulated exactly.

The first major application of gas heat to processing units was in curing and baking ovens used to heat and treat resins, water repellents, resin-bonded colors and other permanent finishes.

The second major application was on new high-capacity gas-heated air dryers, where quality and uniformity of results coupled with rapid drying were required.

Modern gas-heated dryers provide the means of obtaining good uniformity of drying with a minimum of dye migration. During recent years new dyes and fibers have been introduced which cause a greater tendency for the dye to migrate from face to back and from thick to thin yarns. To meet these problems, new types of gas burner have been developed, which are described.

The author offers advice to the prospective purchaser of gas-heated drying equipment as to the important points to be considered before making the purchase.

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The Crease-resisting Process: Additives

Marsh, J T, *Textile Mfr* 86, 449-53, Nov, 1960

Although the conventional crease-resisting process is fundamentally quite straightforward, consisting of impregnation, drying, heating and washing, yet the best results require a considerable amount of care and a high degree of finishing skill, the author says.

The aqueous impregnation solution generally contains three principal ingredients, as follows:

1) The amino-aldehyde condensation product.
2) The catalyst.
3) An auxiliary product or additive.

The mechanism that produces recovery from creasing also reduces the extensibility to some extent and imparts an increase in fiber rigidity. It is the purpose of the additive or auxiliary to obviate or suppress these disadvantages in the product.

The additives fall into the following three types: softeners, emulsion polymers, and silicones. None of these products penetrates the fiber, nor do they actually plasticize the amino-aldehyde condensation product itself.

Modern softeners may be classified as anionic (sulfonated and sulfated oils and fats), cationic (fatty amine salts, quaternary ammonium salts, etc) and nonionic (polyoxyethylene products). The relative merits of the different types are discussed.

Softeners are particularly useful for improving the tear strength of creaseproofed fabric, which is adversely affected by this treatment. Cationic softeners are said to be in widespread use, both in Europe and in the US. Nonionic softeners seem to be preferred in Europe more than in America. Some of the quaternary ammonium compounds are capable af chemical combination with the fiber. Undesirable harshness in creaseproofed fabrics sometimes requires a further treatment with a softener after resinification.

Emulsions of thermoplastic polymers are commonly applied as finishing agents for textiles. Two well-known products are polyvinyl chloride and acetate, but their hardness is such that they can hardly be regarded as either softeners or lubricants. Accordingly they are rarely used as additives in the crease-resist finish, but they are sometimes found in trade products recommended for this purpose. They are said to improve the resistance to abrasion somewhat.

Silicones suitably dispersed, added to the creaseproofing resin, have been found to impart a soft hand and also to improve the recovery from creasing. This is particularly evident in the wet state. The silicones are said to improve the tear strength but not the tensile strength or the resistance to abrasion.

Numerous references are made to the literature and to patent specifications.

The Effect of Laundering Methods on the Wrinkling of "Wash-and-Wear" Cotton Sheets———

(concluded from page 29)

CONCLUSION

In conclusion, this study showed that the method of laundering does affect the wrinkling of "wash-and-wear" shirts. The hand-wash at 105°F, drip-dry method produced the best results as regards wrinkling.

The fifteen-inch "wash-and-wear" fabric squares and "wash-and-wear" shirts showed a similar pattern of wrinkling in laundering. Therefore, the evaluation of surface wrinkling on test squares may be used to predict the surface wrinkling trend on "wash-and-wear" garments made from the same fabric.

In the methods used in this study, water temperature of 140°F in laundering caused more wrinkling in cotton "wash-and-wear" shirts and fabric squares than water at 105°F. Gentle hand agitation developed less wrinkling than the action of a tumbler-type home washer.

Garments with straps included in the laundry load tended to cause wrinkling in "wash-and-wear" shirts and fabric squares. A two-pound laundry load caused less wrinkling than a four-pound load at 105°F and drip drying. Some wrinkles were created in the shirts due to wear.

The pattern of wrinkling in "wash-and-wear" shirts and fabric squares was determined after the first few launderings. In most cases wrinkling in the "wash-and-wear" shirts and fabric squares increased when subjected to fifteen laundering treatments.

"Wash-and-wear" fabric squares were rated higher by the AATCC Tentative Test Method 88-1958 (by Cranston Box illumination) than by the photographic evaluation technique used in this study. "Wash-and-wear" shirts were rated higher by the Cranston box illumination of shirt-back areas than by the photographic or ceiling illumination techniques. When the entire shirt was visible by ceiling illumination, panel ratings were lower than ratings by the Cranston Box and the photographic techniques.

When the panel of five and the panel of fifty rated shirts and fabric squares by the same photographic technique, the results were in complete agreement in the sequence of ratings. The panel of five rated the wrinkling of the shirts higher and the fabric squares lower than the panel of fifty.

The "wash-and wear" fabric met the 230-degree suggested minimum standards for crease-resistant finishes.

LITERATURE CITED

(1) American Society for Testing Materials Committee D-13. *"American Society for Testing Materials Standards on Textile Materials,"* Philadelphia (1959).
(2) "Wash-and-Wear Fabrics—Appearance After Home Laundering." *Am Dyestuff Reptr* 47, No. 15, 578-80 (August 25, 1958).

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The KAE, cosponsored by the National Association of Hosiery Manufacturers, National Knitted Outerwear Association and the Underwear Institute, is expected to attract 15,000 representatives of the domestic and foreign knitting industries.

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OTS to Publish Abstracts of Selected Articles from Red Journals

Abstracts of selected articles from Soviet bloc and Communist Chinese technical journals in six general subject areas will be published monthly and sold on subscription by the Office of Technical Services, Business and Defense Services Administration, US Department of Commerce.

OTS, which is the Federal Government's "clearinghouse" for translations and reports of Government-sponsored research, will offer this program beginning this month, in place of one discontinued last June under which cover-to-cover abstracts of some 100 Russian technical journals were published. The old program was discontinued because of the small number of subscribers to the journals abstracted on the cover-to-cover basis.

The abstracts will be prepared by another agency, but copies will be furnished to OTS for publication and sale to the public. The time lag between publication of the original article in the Soviet bloc or Red Chinese press and publication of the abstracts by OTS is expected to appropriate 70 to 120 days.

Subscriptions to the six new publications, or series, will be accepted for a six-months period. Subscription price for the Chemistry, Chemicals, and Chemical Products series is $6.00 for six months. It is estimated that this series will average 150 abstracts per month.

For further information, write to Publications & Public Information Division, OTS.

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Aldan Rubber Licensed as Syl-Mer Finisher

Aldan Rubber Co, Tioga & Salmon Sts, Philadelphia, Pa, has become a licensed Syl-Mer finisher.

Aldan reportedly will apply the Syl-Mer silicone finish to both natural and synthetic coated fabrics for use in rainwear, thermal insulated clothing, such as children's snowsuits and ski clothes, and other coated products where a high degree of repellency is required.

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Snell Acquires Calkin & Bayley

Foster D Snell, Inc, New York, a 41-year-old firm of chemical consultants, has acquired Calkin & Bayley, Inc, industrial consultants. Calkin & Bayley will be operated as a wholly owned subsidiary of the Snell firm, with George T Bayley, C & B's former president and board chairman, acting as vice president in charge of the Calkin & Bayley Division of Foster D Snell, Inc. The C & B Division will continue to operate from its present offices in the Chemists' Club, 50 East 41st St, New York.

At the same time, Dr Snell announced his company's decision to close its Davis & Bennett Division at Worcester, Mass, "as soon as work in progress can be completed." Noting that all of the Davis & Bennett research facilities are now duplicated by Snell laboratories in New York and Baltimore, Dr Snell said that the Worcester Division could no longer contribute to the overall growth of the Snell organization.

New Approach to Computer Control of Chemical Processes

A joint research program to investigate highly advanced concepts of computer control systems for chemical processes is being conducted by E I duPont de Nemours & Co, Inc and the International Business Machines Corp. The research, including advanced mathematical control schemes and computer techniques, is aimed at bringing a new approach to the control of chemical processes.

The research is being conducted jointly at Du Pont's Repauno Development Laboratory, Gibbstown, NJ, and IBM's Research Center at Yorktown Heights, NY. The contract for the program is scheduled to run until June 30, 1962, but a computer-controlled, chemical reactor is expected to be in operation at Gibbstown by the Fall of 1961.

"In looking to the future, we cannot think simply of adding computer control to existing plants and existing processes," said E R Piore, IBM vice president. "We must think in terms of total systems which integrate the process, the plant and the computer for maximum efficiency."

"The objective of this research is to get the maximum efficiency out of chemical processes through high-speed and precise adjustments, and this program does not have as its purpose the introduction of automated controls to reduce employment costs," stated Charles Brelsford McCoy, general manager of Du Pont's Explosives Department. "In this work we are looking toward the blending of modern chemistry, mathematics, and machine computation to enable us to do things we cannot do in any other way."

Unlike process control in commercial use today, which normally involves averaging a number of static or equilibrium situations, the work by IBM and Du Pont is based on dynamic control techniques—adjusting a process continuously rather than at widely separated intervals.

IBM and Du Pont are developing advanced control techniques by studying a new catalytic process, patented by Du Pont, for making acrylonitrile, a basic material in synthetic fibers. The process makes use of low-cost, abundant raw materials: ammonia, air and propylene. A highly efficient catalyst is used, but its efficiency is sensitive to operating conditions. This presents a serious challenge to computer control—very rapid and precise adjustments are needed to maintain the peak performance.

Also the acrylonitrile reaction is a time-varying, nonlinear system: a given input of energy and material does not produce the same output each time.

Research studies have shown that a significant improvement in the process is possible by adjustments which can be accomplished only through dynamic computer control. Research under the joint IBM-Du Pont contract is thus developing methods of dynamic optimization—constantly approaching the best operating condition—rather than depending upon current static control methods. Advanced mathematical control schemes have had to be devised which can track the behavior of the acrylonitrile process at all times.

Control at this advanced level means that the digital computer must be tied directly into the process through analytical instruments such as mass spectrometers and vapor phase chromatographs. These analytical instruments continuously measure and determine changing proportions of the chemical compounds in the process stream and feed the results into the computer. Then the computer processes these data, along with temperature, pressure, and flow information, and makes the requisite adjustments to the chemical process. The entire computer cycle of sampling, data analysis, and process adjustment is completed in a matter of minutes.

New computer techniques of this nature give the necessary speed and precision to enable Du Pont to take maximum advantage of an advanced catalyst. For the first time, a process can be designed to operate in a condition where frequent changes are necessary and where even a minor control error or delay could lead to formation of unwanted by-products and measurable economic losses. A major economic advantage is anticipated once computer directed, dynamic control is perfected for commercial operation.

Tongue Tear Test Cited as Practical Tool in Finishing Plants

The standard tongue tear (single rip) test can tell much more about a fabric than whether or not it meets tear strength specifications, according to E James Stavrakas, senior research associate at Fabric Research Laboratories, Inc, Dedham, Mass.

Speaking recently before the Quebec Section of the Canadian Association of Textile Chemists and Colourists, Stavrakas termed the tongue tear test "an analytical research tool all too often relegated to role of a routine test". Stavrakas shared the speaking platform with Joseph S Panto, also an FRL senior research associate, and their joint subject was "Research Techniques as Practical Tools in the Finishing Plant".

Most mills and finishing plants now use the tongue tear test for standard specification testing, Stavrakas said. In this limited use of the test there is only one goal: Does the fabric meet the minimum requirements of tear strength? If it does, then there may be no need to pay any further attention to tear strength.

But, he said, if tear strength is unacceptable, the study of tear diagrams may very well indicate the cause.

The main factors influencing tear strength are, according to Stavrakas, 1) yarn tensile strength, 2) the number of yarns which "group" to combat the tear forces, 3) the uniformity of load being borne by these yarns, and 4) the support of the fabric surrounding the region being torn.

Anything which alters one or more of these factors will change the tear strength. Typical causes are 1) changes in yarn tensile strength, 2) changes in fabric lubricity and mobility, and 3) changes in crimp level, crimp balance, and mobility. One or more of these frequently result from various finishing treatments, particularly scouring and resin treating, Stavrakas said.

The important thing to realize, according to Stavrakas, is that the tongue tear diagram, intelligently interpreted, can often identify the *causes* of lowered tear strength and once these are known it becomes possible to take corrective measures.

Citing an example, Stavrakas described the tongue tear load elongation diagram of a scoured fabric in which the diagram consisted of an almost uniform series of "peaks" corresponding in number to the number of cross-threads in the torn part of the fabric. This meant, he said, that yarns were rupturing one at a time with the magnitude of the individual "load drops" (difference between upper and lower peaks) roughly approximating yarn tensile strength. The same fabric, before scouring, exhibited a series of higher peaks but fewer in number. These were explained by Stavrakas as illustrating a condition in which the yarns did not always rupture individually; sometimes two or three ruptured simultaneously.

The tear diagram clearly showed, therefore, a restriction of yarn mobility after the fabric had been scoured. It did not show *why* the mobility was restricted but the fact that scouring removes natural lubricants, combined with the evidence of the tear test, easily suggests the probable cause for the lower tear strength, Stavrakas said.

In another instance of similar load elongation diagrams it might be inferred with equal clarity that a finishing treatment has weakened tear resistance by changing crimp balance rather than by removing lubricants, he said. This might happen if the fabric had been stretched inordinately in one direction. The tear diagram does not provide all the answers but it does define conditions which lend themselves to intelligent interpretation, Stavrakas concluded.

He also discussed wrinkle resistance testing and termed total reliance on warp or filling direction crease testing "unrealistic". To get a real index wrinkle resistance one must test not only in the warp and filling directions, but across the bias, face to face, back to back, and under varied and changing conditions of humidity. "There are few fabrics which accommodate the laboratory by wrinkling only in one direction or by wrinkling uniformly in all humidity conditions," he noted.

Panto discussed the use of a spectrophotometer with ultraviolet attachment to establish precise scouring tolerances in order to insure sufficient scouring, eliminate overscouring, and maximize the efficiencies of time, temperature, and chemicals for any given scouring operation.

He also discussed in some detail the techniques he has used in the laboratory to determine optimum dyes and dyeing conditions for some of the new and difficult-to-dye fabrics made of synthetic fibers.

Novel Process for Manufacture of Caprolactam Acquired by Allied Chemical

Implementing and expanding the close relationship between Allied Chemical Corp and Snia Viscosa of Milan, Italy, in the chemical, plastics and fiber fields, Allied announced recently that it has acquired Snia Viscosa's new process for the manufacture of caprolactam. The new process, not yet in commercial use, was developed in the laboratories of Snia Viscosa from whom Allied has acquired exclusive rights for United States and Canada. The process, which has been under study by Allied for some months, differs from that currently in use by Allied, the sole producer of caprolactam in the United States.

Starting with raw material toluene instead of phenol, the addition of the Snia Viscosa process to Allied's Hopewell, Va, complex, is expected to provide Allied with broad flexibility in its operations including the production of derivatives and intermediates of commercial importance other than caprolactam. Allied commenced caprolactam production in 1954 as part of its nylon 6 program, also pioneered in this country. Caprolactam is the monomer for nylon 6, which has grown steadily in the fiber field. Allied expects its collaboration with Snia Viscosa to result in substantial new applications for nylon 6 molding compound. Allied has previously announced its plan to expand its monomer nylon 6 tire yarn production and to install facilities for the manufacture of textile yarns.

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Source of Sodium Dispersions

Acton Laboratories, 1180 Raymond Blvd, Newark 2, NJ, has announced availability of dispersed sodium in two standard products: 50% sodium dispersion in mineral oil stabilized with 2% aluminum stearate and sodium-naphthalene dispersion, mole/mole, crushed solids.

The nature of these products reportedly prohibits sampling, but orders for single-pound lots for $10.00 are accepted by Acton.

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New NSCC Polymer Plant "On Stream"

National Starch and Chemical Corp's 14-million-pound polyvinylidene chloride resin plant at Meredosia, Ill is now "on stream". The company's new facility is in commercial production of Resyn 3600, an aqueous dispersion of vinylidene chloride copolymer.

While under development for more than five years, Resyn 3600 was only revealed commercially in May of last year. It offers interesting possibilities as a chemical-resistant coating, a textile saturant, as a binder for nonwoven industrial fabrics, and as a finish for industrial and work clothing fabrics.

The new plant is the latest addition to NSCC's multiple-plant operation at Meredosia which also includes one of the world's largest polyvinyl acetate emulsion facilities. The combined productive capacity at Meredosia now exceeds 80 million pounds of various polymer emulsions and latices annually, it is reported.

The design and construction of the plant was handled by Blaw-Knox Co with provision for early expansion.

National, which operates additional polymerization facilities at Plainfield, NJ, Toronto, Canada; Mexico City, Mexico; and London, England, recently joined forces with Jordan Chemical Works (A'sia) Pty Ltd, Sydney, Australia, in the formation of a new company, Jordan-National Co Pty Ltd mutually owned by National and Jordan. Jordan-National will manufacture and sell vinyl polymers and various adhesives made in the United States by National. Manufacuring facilities and executive offices will be located in Sydney. Max Glaser, managing director of Jordan Chemical Work, will also serve in a similar capacity for the new concern.

Jordan is a leading producer in Australia of synthetic resins and chemicals.

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A Century For Silicate at PQC

One hundred years ago, the 21st of January, Philadelphia Quartz Co made its first commercial sale of sodium silicate. The producer this year celebrates its 130th Anniversary. The founders of the company for the preceding 30 years were in the soap and candle business. Since 1904 Philadelphia Quartz Co has specialized in the manufacture, development and application of the sodium and potassium soluble silicates.

BDA Celebrates 62nd Birthday

Bradford Dyeing Association, reputedly the world's largest fabric finishing organization, recently celebrated its 62nd birthday. Organized as a public corporation in December, 1898, the company now has some 30 plants in England, the United States, Canada and Australia.

In the last decades of the last century, a number of businesses engaged in piecework dyeing of fabrics produced in the Yorkshire-Lancashire textile districts in England aggregated into a loose federation known as the Bradford Piece-Dyeing Trade. The public corporation called Bradford Dyers' Association, formed in 1898, bought up a number of these businesses and before long controlled many of the dyeing-finishing works in the area. The immediate result was more efficient central operation, with individual units specializing in one area of the dyeing-finishing business.

Almost immediately, a collateral advantage became apparent. The best brains of all the small units began pooling their ideas on dyeing and finishing of goods and exploring new techniques. Two years after the corporation was formed, a shower-proof finish for cottons, Cravenette, was developed. It is still in use today.

Lining fabrics tell part of the century's history. Mohair and Alpaca were popular when BDA was young; from the Twenties on, synthetics and cottons became the public choice. Three of Bradford's 18 finishing plants in the United Kingdom handle nothing but rayons, cotton mixtures and nylons for linings.

Early in the twentieth century, much of the cloth finished in England was for export to Asia and the Western Hemisphere. Black mercerized and schreinered venetian cottons were processed for these mass markets in large quantities.

The year 1911 saw the development of deluxe finishes for cotton fabrics and of a vat-dyeing process which permitted the dyeing of cottons with greater resistance to fading from washing and light. These and other steps forward sparked an expansion. Bradford USA was established in the little town of Niantic, near Westerly, RI. The town, which is now called Bradford, is on the banks of the Pawcatuck River.

Bradford has been in the forefront as synthetic fabrics emerged from chemical laboratories and entered the market. The first man-made fibers came in the Twenties; BDA developed numerous dyeing and finishing techniques for handling them.

In 1931, the company was among the leaders in attacking another problem area—the shrinkage problem in cotton goods. In that year BDA introduced its Rigmel process, a compressive technique that is said to increase the shrink resistance of cotton goods while improving the hand and finish of the fabric.

In 1940 the Bradford organization plunged into the problems of finishing spun viscose. The year 1945 produced a shrink-resistant finish for washable rayon crepes. World War II sparked the production of many special durably finished fabrics and stimulated the development of many new synthetics.

Research, of course, is an important part of Bradford's work around the world. In the Rhode Island plant, a large staff of chemists, chemical engineers and experts in allied fields appraise production methods and work to solve new and old problems. A large central laboratory erected two years ago in the heart of England's textile country has centralized the research activities of the 18 United Kingdom finishing units. Among recent developments: a technique for printing designs on tufted carpets, claimed to be the first of its kind.

The Bradford organization in the US finishes more than 10 million yards of fabric a month. The plant on the Pawcatuck uses enough power to light a city of 10,000; the exhaust steam from the turbines on the generators is used to heat the necessary water from the river.

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BRL Extends Lab Services

Bjorksten Research Laboratories, Madison, Wis. and Houston, Texas, has announced the extension of its laboratory services to include custom organic syntheses. It recently installed, in a separate building at its Madison laboratories, reaction and still equipment of up to 30-gallon capacity suitable for organic syntheses, polymerizations, etc.

Bjorksten Research Laboratories, an independent research organization, conducts sponsored research and development for both industry and government. The scope of its activities includes organic and polymer chemistry, inorganic and high temperature materials, theoretical and applied physics, metallurgy, and the biochemical sciences.

Unusual Entries in OSMM's Exhibition

Upwards of 50 pictures and sculptures were on view at Old Slater Mill Museum, Pawtucket, RI, at last month's fifth exhibition of Blackstone Valley Artists, sponsored by the Museum.

Two unusual entries most appropriate to the location of the show in America's first successful textile mill were landscapes done in concentrated textile dyes on singed lapping cloth. They are the work of George Kabbeze of 173 Illinois St, Central Falls, RI, a self-taught artist. Mr Kabbeze was formerly employed at the old Paramount Printing & Finishing Co in Pawtucket.

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Antara Names New Distributor

Missouri Solvents & Chemicals Co, 419 DeSoto Ave, St Louis, Mo, and 2522 Nicholson Ave, Kansas City 20, Mo, has been appointed distributor for two major chemical product lines by Antara Chemicals.

Under this new arrangement, the Missouri company will handle Igepal CO and CA nonionic surfactants and Cheelox chelating and sequestering agents for a considerable territory, which includes the St Louis and Kansas City areas, as well as south Illinois, west Kentucky, Tennessee, north Arkansas, Missouri, Kansas, south Iowa and southeast Nebraska.

Both chemicals will be supplied by Missouri Solvents & Chemicals Co in drum and bulk lot truck shipments. The company also provides service facilities for blending of surfactants.

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NCC Investigating Efficiency of "W-W" Cycles in Home Washers

Do special "wash-wear" cycles in home washing machines get clothes clean? The National Cotton Council is conducting a research project to find out.

Observations made by the Council so far indicate that they do not, probably because water temperatures and washing action are too mild for effective cleaning.

"Wash-wear" cycles on washing machines have been designed to meet specifications set fourth by manufacturers of synthetic fibers. They recommend laundering synthetic "wash-wear" garments at temperatures of 100°F or cooler, with gentle agitation, according to the Council.

Lower temperatures are necessary for thermoplastic synthetics such as nylon to prevent fiber softening and resulting heat-set wrinkles in the garment.

Because the effectiveness of soap and detergents is reduced at low temperatures, the Council suspects that garments, regardless of fiber content, do not come clean under these conditions and will accumulate soil and odor.

By contrast, the Council says, "wash-wear" garments made of 100 percent cotton are being laundered commercially at temperatures up to 180 degrees.

One result of the research project may be a recommendation that "wash-wear" all-cotton garments be home laundered using the same washing machine settings as those used for untreated cottons. This would be a temperature range of 140 to about 160 degrees.

The study, which is being conducted at Texas Women's Univ, Denton, Tex, will include laundering of different garments at high and low temperatures after wearing. Cottons, synthetics, and blends of cotton with synthetics will be tested for soil and odor removal, and need for ironing after laundering.

Joint sponsor of the study is the Cotton Research Committee of Texas.

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16th Purdue Industrial Waste Conference

The 16th Purdue Industrial Waste Conference will be held May 2, 3, and 4, in the Purdue Memorial Center, Purdue Univ, Lafayette, Ind.

There will be approximately fifty papers presented on subjects dealing with industrial wastes and their treatment.

Hotel reservations can be made at the Purdue Union Club, Van Orman Hotel, Cedar Crest Hotel, Morris Bryant Motor Hotel, Esquire Motel, Devon Plaza Motel or Howard Johnson Motor Lodge.

Everyone is welcome. Registration blanks will be mailed upon request.

For further information, write to Conference Chairman Don E Bloodgood, Purdue Univ School of Civil Engineering, Lafayette, Ind.

SOCMA Brief Objects to Basket Categories

In line with its policy of selective tariff legislation, the Synthetic Organic Chemical Manufacturers Association has filed a brief with the United States Tariff Commission and the Committee for Reciprocity Information objecting to basket categories contained in the supplementary list of products proposed for consideration for possible US concessions at the forthcoming GATT trade agreements negotiations.

This brief is supplemental to the one similarly filed this past June 27, 1960, which dealt with the basic list of prepared for trade argeements negotiations under the General Agreement on Tariffs and Trade. On July 11, 1960, testimony was also given on the basic list by Samuel G Baker, at that time president of SOCMA, before the US Tariff Commission and the Committee for Reciprocity Information.

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Rise in Color Sheet Sales Predicted for '61

Increased sales of colored sheets and pillow cases are predicted for 1961, according to several leading domestic mill producers now carrying out merchandising plans. Most mills reportedly are featuring a wider number of colors in both solids and fancies in anticipation of the growing consumer interest in "sheet fashion."

Significant among mill plans is the use of documented findings of a recent nationwide survey conducted by The Vat Dye Institute, Inc, which revealed a wide-open market for higher color sheet sales and indicated methods for capitalizing on the potential.

A special summary of the motivational and statistical research published in booklet form by the Institute was distributed by request to all domestic mills for study and use by merchandising executives. Several mills report inclusion of the findings into sales meetings, and also in information to retail buyers.

Cannon Mills plans extensive use of color for 1961. According to W H Mann, vice president, figures released by the Vat Dye Institute substantiate findings of Cannon Mills in surveys it has conducted to discover consumer receptivity to color during the past few years.

Lilac has been added to the growing Cannon color line. In addition to solids which account for a sizeable portion of Cannon sales, several more prints on colored backgrounds will be added to the new line. Their packaging stresses colorfast guarantee on all colored sheets and pillow cases.

E S Taylor, manager of the Utica-Mohawk Division of J P Stevens Co, has "found the Vat Dye Survey educational and helpful. We have felt and been aware for some time now the rapid growth expected in color, and are prepared for it," he continued.

Rise of lilac in popularity in domestic as well as other nome furnishings items has been noted by Fieldcrest Mills, which is adding it to its new line, according to Frank Larkin, assistant manager of the Sheet Department. Fieldcrest also notes drop in woven stripes in favor of prints and other fancies.

"We have noted great acceptance of our coordinated groupings," Mr Larkin commented, "in solid bottom sheets teamed with overall prints in identical or harmonizing background color."

Fieldcrest's color line now numbers nine shades; pink, blue, yellow, green, aqua, biege and the newest colors; lilac, apricot and ebony.

Newly revised tags on the Fieldcrest line which stress the colorfast qualities in washing are a result of the VDI survey.

Other leading mills such as Pepperell Mfg Co, Indian Head Mills, Dan River Mills, Springs Mills, Wamsutta Mills and Pacific Mills, both Divisions of M Lowenstein & Sons, Inc, and Minot Hooper Co plan practical application of survey results by intensive promotion color during the coming months, it is reported.

The Vat Dye Institute survey conducted among consumers last year showed that more than 50% of American households do not own colored sheets and pillow cases. Of the homes who do own colored domestics, only 36% buy color regularly for themselves, the others received color sheets and cases as gifts.

A follow-up poll of August White sales results in leading department and specialty stores in 10 key markets further indicated that colored sheet users buy more often, because although sales generally were down, sales of colored sheets and cases were up in every instance.

PERSONALITIES IN THE NEWS

August Van Der Woude Jr has joined The Harshaw Chemical Company, Zinsser Division, Hastings-on-Hudson, NY, as technical representative of the Textile Products Division. Mr Van Der Woude was previously employed as assistant plant chemist by the Waldrich Co, Delawanna, NJ.

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Herbert C Olsen has been appointed manager of textile service and development for National Starch and Chemical Corp.

Mr Olsen, who joined NSCC in 1939, will continue to make his headquarters at the Company's Alexander Laboratories, Plainfield, NJ.

●

M A Kise, director of research and development for the Virginia Smelting Co, recently announced the appointment of *E B Hotelling* to the newly created position of associate director of research.

Prior to joining the Virginia research staff, Dr Hotelling was associated with the American Machine and Foundry Co.

As associate director, Dr Hotelling will spearhead Virginia's new product development program from the company's research center and executive headquarters in West Norfolk, Va.

●

Theodore A Jeffords has joined Interchemical's Color & Chemicals Division. He will act as a technical representative in the Southern sales district of the Division with headquarters at Rock Hill, SC.

He was previously with USF—Arnold Finishing Division, Hoosac Mills Division of Indian Head Mills, Inc as plant chemist.

●

Penick & Ford, Ltd has announced the appointment of *John P Bainbridge Jr* to the post of New England district sales manager. Mr Bainbridge was formerly assistant service manager of Penick & Ford at Cedar Rapids, Ia.

Walter H Hindle has been elected a Fellow of the Society of Dyers and Colourists, an honor conferred by the Society for major contributions in the fields of dyeing and finishing technology. Mr Hindle is president of Walter H Hindle, Inc, fiber development consultants, New York.

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Olsen

Hotelling

Jeffords

Bainbridge

Archiable

Boyd

Brown

Ebersole

Hamilton

Mayhew

Several major changes in the company's organization have been announced by Emery Industries, Inc.

John M Archiable has been named director of foreign operations. Currently, this includes responsibility for Emery Industries (Canada) Ltd in London, Ontario, and Emery's managerial responsibilities in Unilever-Emery N V in Gouda, Holland. In addition, Mr Archiable has been appointed corporate director of the manufacturing staff.

At the same time, it was announced that the Chemical Division has been divided into two operating divisions; the Organic Chemicals Division and the Fatty Acid Division. *R F Brown* has been named general manager of the Organic Chemicals Division and G W Boyd, general manager of the Fatty Acid Division.

This shift gives each product group full divisional status and each general manager has complete line authority over marketing, research, development, and manufacturing in their respective divisions. The Fatty Acid Division involves all Emery fatty acid products and the Organic Chemicals Division includes derivatives such as textile chemicals, plasticizers, dimer acids, and special acids.

Mr Archiable has been works manager for the past 13 years.

Mr Boyd had been sales manager of the Fatty Acid Sales Department for the past five years.

Mr Brown had been associated with sales for the past 15 years. For the past five years, he was sales manager of the Organic Chemicals Sales Department.

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The Tecnical Department of Onyx Chemical Corp, under the direction of *R L Wakeman*, is continuing its expansion program with the addition of several specialists to its research staff. These chemists are *Sidney Cohen*, who has been appointed head of textile research and development; *Joseph Coates*, who will be engaged as chief research chemist; and *Walter Brandenburg*, who, as pilot-plant supervisor, will be involved with process development, carrying new products from the laboratory level to manufacturing stages of production.

Dr Cohen was with Hart Products Corp as technical director before he became associated with Onyx. Mr Coates was formerly employed in the research laboratories of the Atlantic Refining Co. Dr Brandenburg was previously employed by Heyden Chemical Corp.

Recent junior chemist additions to the Onyx technical staff include *John Schaubach*, *Salvatore Eretto Jr*, *Richard Beane Jr* and *Walter Czerniec*.

●

Three appointments in the Research and Commercial Development Department of the Chemical Group, General Aniline & Film Corp, have been announced.

Francis J Prescott was named manager—market development, and will be responsible for market development activities on new products for the corporation's Chemicals Group (formerly the Dyestuff and Chemical Division), which includes the Antara Chemicals, Collway Pigments, and General Dyestuff Company Divisions. Mr Prescott was formerly supervisor—sales development.

Albert Bloom, manager—business research of the Dyestuff and Chemical Division, retains this position under the new Chemicals Group structure. He is in charge of market research, Government research contracts, and industrial and Government intelligence for the Divisions.

Helen M Schleiter has been appointed assistant to *Cecil M Knowles*, manager—commercial development.

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Manufacturers Chemical Company, Inc, Camden, NJ, has appointed *Robert M Tong* general sales manager. Mr Tong was formerly with General Latex and Chemical Corp.

Realignment of two administrative responsibilities in the recently created Marketing Administration Department at General Aniline & Film Corp have been announced.

Under the new structure, which affects the chemical, pigment and dyestuffs divisions of the corporation (formerly the Dyestuff & Chemical Division), the following two executives were named to the new Marketing Administration staff:

Fred Ebersole was appointed manager—distribution and inventory control services, and *Robert J Hamilton* has been named manager——advertising and promotion. Both will maintain headquarters at 435 Hudson Street, New York.

For this new position, Dr Ebesole will be responsible for sales forecasting by product, as well as the national distribution of finished goods, including operations of the branch warehouses and offices, integrating these functions with the maintenance of proper inventory standards. Inventory planning by his department at the Group Level will be closely related functionally, with production planning and scheduling at the company's three manufacturing plants at Linden, NJ; Rensselaer, NY; and Calvert City, Ky.

Mr Hamilton, who had been in charge of advertising activities for the Dyestuff and Chemical Division, will now also be responsible for all promotional functions, technical literature writing and production, the divisions' sample department, and sales promotion. His staff is being expanded also to carry these additional responsibilities for the chemical, pigment and dyestuffs groups.

He joined General Aniline & Film Corporation in 1929 and has held a number of sales and communications positions.

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Raymond L Mayhew has been named to the position of manager—technical service and development at Antara Chemicals, General Aniline & Film Corp.

Dr Mayhew's assignment is a new position within the recently changed structure of GAF's Chemicals Group (formerly the Dyestuff and Chemical Division).

While there have been a number of recent personnel shifts involving new assignments, the following product manager's positions at this Division, however, remain unchanged and are being confirmed at this time: *A E May*, surfactants; *A E Underwood*, heavy chemicals; *P E Dalton*, acetylene chemicals, and *F Card*, chemical intermediates.

In this new position, Dr Mayhew will be responsible for technical service as well as sales and product development of present product lines. He will maintain his headquarters at 435 Hudson St, New York.

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M A Lynch Jr has been appointed assistant to the manager of product marketing for the Silicones Division, Union Carbide Corp. He has served as textile products manager since 1959.

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BERNARD WOODLEY

Rodney Hunt Machine Co received word recently that *Bernard Woodley*, the company's sales and service engineer in the Far East, had died in Alexandria, Egypt. Woodley had been hospitalized for several weeks, following a heart attack.

Mr Woodley, who was 68 years old, began his association with Rodney Hunt in 1953, and since then has made his residence in Bombay, India.

For many years, prior to joining Rodney Hunt, Mr Woodley hade been engaged in sales work in India, the Middle East, Europe and South America. He also worked for such companies as Arlington Mills, Hockanum Mills, Exeter Manufacturing Co, and H W Butterworth & Sons Co in this country.

Burial was in the Protestant Cemetery in Alexandria, Egypt.

APRN Addenda

The following series of listings, originally intended for the Annual Processing Review Number of December 12, 1960, was received too late for inclusion.

SONNEBORN CHEMICAL AND REFINING CORP
300 Park Ave South
New York 10, NY

Fybrol 661

An economical antistatic processing lubricant for wool fibers and blends of wool and synthetics. It is said to be light in color, non-oxidizing and nonyellowing, thus assuring clean yarns and fabrics. Controlled balance of lubricity and cohesion reportedly impart to the stock those qualities which result in higher yields during carding and greater uniformity in drawing and spinning.

* * *

Fybrol 3628

A high-quality antistatic fiber lubricant for wool, synthetic fibers and blends to be processed on the English, French and American worsted systems. It is said to combine the advantages of a powerful antistatic with a high degree of lubricity and fiber cohesion. It reportedly is non-oxidizing, nonyellowing, nongumming and exhibits unusual storage stability. Due to built-in detergent properties it is claimed to be completely self-scouring. May be applied neat or from emulsion.

* * *

Fybrol 3732

A unique antistatic wool fiber lubricant which is said to be perfectly compatible with either carbonizing acids or acid fulling baths. Wool oiled with Fybrol 3732 reportedly need not be scoured prior to carbonizing or acid fulling.

* * *

Sonofin 3639A

A nonionic white polyhydric alcohol derivative suitable as softener/lubricant in many applications. Reportedly inhibits static formation and is compatible with a wide variety of dyes and finishing agents, such as resins, catalysts and dye fixatives. Resin-treated cotton fabrics processed with Sonofin 3639A in the same bath are said to offer improved sewability, tear strength, crease recovery, resistance to abrasion and chlorine retention. It serves also as a lubricant for knitting yarns, as a napping lubricant and plasticizer for many warp sizes.

* * *

Sonolene GR

An anionic powder containing protective colloids and surfactants, acting synergistically, in the cleaning of graphite-stained nylon lace. It is said to effectively remove graphite from fabrics, holding it in suspension to prevent redeposition. Reportedly disperses readily in hot water (160-180°F) with mechanical agitation. Applied at room temperature in one- or two-bath system.

* * *

Sonostat 60

A new antistatic agent which reportedly imparts a high degree of static inhibition at low cost to all types of fibers.

Sonostat 60 is a 100% active, nonionic liquid that is said to be readily emulsifiable. It is amber in color, and contains no mineral oil.

The product reportedly is stable toward oxidation, discoloration, or odor development, and will not corrode equipment. It scours readily and will assist in the removal of spinning lubricants that may be present on the stock, according to Sonneborn.

Emulsions of the micellar type can be prepared by adding Sonostat 60 to warm water of room temperature with slight agitations. Such emulsions have excellent stability, the company reports.

While Sonostat 60 lends itself to neat application, it usually is applied from emulsion by spraying. Concentration of emulsions will depend on the type of fibers to be processed, method of processing, and individual mill requirements. Concentrations of up to 7.5% are practical.

Sonostat 60 reportedly will impart antistatic properties when added to proprietary processing lubricants in any desired proportion. Because it is nonionic, it is generally compatible with commercially available processing oils. Experiments reportedly show that the addition of 10-20% of Sonostat 60 to a proprietary oil is sufficient to impart adequate antistatic properties.

The product also may serve as a nonpermanent antistatic agent in fabric finishing.

* * *

Sonowax 675

A nonionic, chemically modified microcrystalline wax emulsion recommended by Sonneborn as a softener in textile wet processing. Will not oxidize under influence of heat or light; will not discolor or develop odor, it is claimed. Compatible with resins and catalysts, may be used in conjunction with these or other finishing aids to improve tear strength, abrasion resistance, crease recovery and sewability (up to 25%) of cotton fabrics.

* * *

Textiline 3645

A powerful antistatic spinning aid for polyester and acrylic staple; 100% active, contains no mineral oil. Reported to be clear soluble in water at room temperature in all practical concentrations. Compatible with fugitive identification tints; will not impair their fugitivity.

* * *

Textiline 3663

A low-viscosity antistatic coning oil for textured yarns. Chemically nonionic, it is highly stable and does not contain solvents. Recommended by Sonneborn where consistently uniform and low tension during coning and knitting is essential regardless of amounts of oil applied. Low dynamic coefficient of friction. Readily removable in light boil-off.

* * *

Textiline 4000

An anionic, light-colored coning oil of low viscosity for textured yarns. It is said to offer antistatic and lubricating properties. Particularly suitable for application of bulked filament nylon 6 to improve tufting operations. Used neat or from emulsion.

GENERAL CALENDAR

ACHEMA
June 9-17 (13th International Chemical Engineering Exposition and Congress———Frankfurt am Main, Germany)

AMERICAN CHEMICAL SOCIETY
Mar 21-30 (139th National Meeting, St Louis, Mo)

AMERICAN COTTON MANUFACTURERS INSTITUTE
Mar 23-25 (12th Annual Meeting, Fontainebleau Hotel, Miami Beach, Fla)

AMERICAN HOME ECONOMICS ASSOCIATION
June 27-30 (52nd Annual Meeting———Cleveland, Ohio)

AMERICAN OIL CHEMISTS' SOCIETY
May 1-3 (34th Annual Meeting, Sheraton-Jefferson Hotel, St Louis, Mo)

AMERICAN SOCIETY FOR QUALITY CONTROL
Feb 16-17 (Eleventh Annual Conference of the Textile and Needle Trades Division———Robert E Lee Hotel, Winston-Salem, NC)

CHICAGO SECTION, AMERICAN CHEMICAL SOCIETY
Sept 5-8 (11th National Chemical Exposition———Chicago Amphitheatre, Chicago, Ill)

FIBER SOCIETY
April 27-28 (Spring Meeting———Georgia Center for Continuing Education, Athens, Ga)

INTER-SOCIETY COLOR COUNCIL
April 10-12 (30th Annual Meeting———Sheraton Hotel, Rochester, NY)

INTERNATIONAL TEXTILE MACHINERY EXPOSITION
1962 (3rd Exposition, Hanover, Germany)

KNITTING ARTS EXHIBITION
April 24-28 (Atlantic City Auditorium, Atlantic City, NJ)

NATIONAL COTTON COUNCIL OF AMERICA
Nov 8-9 (1961 Chemical Finishing Conference———Sheraton Park Hotel, Washington, DC); Oct 3-4, 1962 (1962 Chemical Finishing Conference———Sheraton Park Hotel, Washington, DC)

PURDUE INDUSTRIAL WASTE CONFERENCE
May 2-4 (16th Conference———Purdue Memorial Center, Lafayette, Ind)

SCHWEIZERISCHER VEREIN DER CHEMIKER-COLORISTEN
October 12-14 (Symposium on "Permanent Finishing 1961"———Swiss Federal Institute of Technology, Zurich, Switzerland)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Jan 10, Feb. 16, Mar 14, Apr 13 (Luncheon Meetings———Palm Terrace Suite, Hotel Roosevelt, New York, NY); May 22-24 (Spring Outing———Skytop Lodge, Skytop, Pa); June 13, Sept 12, Oct 10, Nov 14 (Luncheon Meetings———Palm Terrace Suite, Hotel Roosevelt, New York, NY); Dec 7 (Annual Meeting and Dinner ———Hotel Roosevelt, New York, NY)

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY
Feb 20-23 (46th Annual Meeting———Hotel Commodore, New York, NY)

UNION OF PURE AND APPLIED CHEMISTRY
August 6-12 (18th International Congress of Pure and Applied Chemistry———Montreal, Canada)

WORLD CONGRESS FOR MAN-MADE FIBERS
May 15-18, 1962 (2nd World Congress, London, England)

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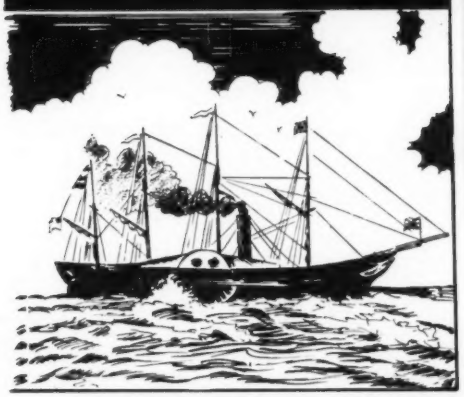

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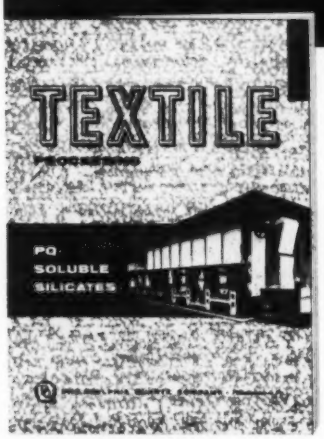

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NEW PRODUCTS AND DEVELOPMENTS

Five New Tergitol Nonionics

Five new nonionic surfactants have been introduced by Union Carbide Chemicals Co, making a total of 20 surfactants—15 of them nonionics—available from Carbide.

Three of the new surfactants—Tergitol nonionics 12-P-6, 12-P-9, and 12-P-12—are based on dodecyl phenol. Two are based on trimethyl nonanol——Tergitol nonionics TMN-3 and TMN-10.

Tergitol 12-P-6 is a dodecyl phenol adduct with six mols of ethylene oxide. It is soluble in aromatic and aliphatic hydrocarbons and is said to be suitable for sulfation. Tergitol 12-P-9 is a dodecyl phenol adduct with nine mols of ethylene oxide. It is soluble in aromatic hydrocarbons and reportedly can be used in place of nonyl phenol adducts containing five to eight mols of ethylene oxide. Tergitol nonionic 12-P-12 is a dodecyl phenol adduct with 12 mols of ethylene oxide. It is a general purpose nonionic, said to be completely water soluble.

Tergitol TMN-3, a trimethyl nonanol adduct with three mols of ethylene oxide, is soluble in aromatic hydrocarbons and slightly soluble in aliphatic hydrocarbons and mineral oil. Tergitol TMN-10 is a trimethyl nonanol adduct with 10 mols of ethylene oxide. This general purpose surfactant is also said to be completely water soluble.

Tergitol nonionics 12-P-6, 12-P-9, and 12-P-12 are available in tank car quantities (the latter two upon notice) and drum quantities. Prices are 22-½ cents a pound for tank-car lots, 25 cents a pound for truck-loads of drums, and 27 cents a pound for less than truck-load lots of drums.

Tergitol nonionics TMN-3 and TMN-10 are available in drum quantities. Prices are 27-½ cents for truck-loads of drums and 28-½ cents a pound for less than truck-load lots of drums.

●

Quindo Magenta RV-6803

A new quinacridone pigment with a brilliant red-violet hue—Quindo Magenta RV-6803—is now available from Harmon Colors, Allied Chemical's National Aniline Division.

The pigment reportedly will give fiery red shades with molybdate orange, clean pastel tones with titanium dioxide, bright iridescent red-violet shades with nonleafing aluminum, and brilliant yellow-toned iridescent maroon colors with aluminum and gold paste or other yellow and orange pigments.

It is reported that coatings made with Quindo Magenta RV-6803 in five different vehicles were put through exposure tests in Florida and found to have good color retention.

Quindo Magenta RV-6803, for all practical purposes, is said to be nonbleeding in automotive and industrial finishes and textile ink applications.

Other Quindo Magenta pigments include Resinated Quindo Magenta RV-6804 for dispersion in printing ink and plastic applications and Quindo Magenta Presscake RV-6813 for resin flushings, water dispersions, emulsion paints, and textile emulsion printing inks.

For more information, write Dept PR 88, National Aniline Division, 40 Rector St, New York 6, NY.

●

New Family of Printing Pastes

In the printing of textile materials by any of numerous methods, the use of printing pastes to carry or stabilize the colored pigments is standard practice. Many printing pastes available at the present time rely on cooking at high temperatures to regulate or adjust their viscosity. In these cases, exact viscosity is absolutely essential to success of the subsequent printing operation.

Commonwealth Engineering Co of Ohio, 1771 Springfield St, Dayton 3, O, reportedly has developed a new family of printing pastes and putties which require no elevated temperatures for preparation, and can be mixed directly to give the exact viscosity desired in the particular pigment or dye mix.

Incorporaing a new type of dextran bodying agent, the new printing pastes are said to be capable of producing sharp designs of even intricate, closely spaced, multicolored lines without running or smudging. The new pastes also are said to be very satisfactory in resist-type printing, in which the paste shields portions of the fabric from coloration by a dye.

The new pastes, protected by U S Pat 2,933,403, are available for license.

Procion Brilliant Blue H5GS

The latest addition to the range of Procion and Procion "H" dyestuffs is said to mark a significant advance in the field of reactive turquoise blues. Procion Brilliant Blue H5GS is a little redder in shade than Procion Brilliant Blue H7GS. Both are specialties of Arnold, Hoffman & Co, Inc.

Procion Brilliant Blue H5GS is said to be notable because of its excellent building-up properties and its freedom from staining during washing off. The new dye may be applied by the normally recommended formulas for Procion "H" dyes, using either conventional or emulsion thickenings. Besides its value in self-shades, it is suitable for admixture with yellow Procion "H" dyes to give a range of brilliant greens, the Company states.

In the dyeing field, it is suggested that the high tinctorial strength, low affinity, and ease of washing off with Procion Brilliant Blue H5GS will be of greatest value in continuous dyeing processes. For these reasons, Arnold, Hoffman envisages its wide use among dyers using such processes to produce the still-popular deep turquoise blues and greens on dress materials of cotton and viscose rayon. It is also anticipated that there will, in addition, be many useful outlets in batchwise dyeing processes on cotton.

Samples and application data are available on request from Arnold, Hoffman & Co Inc, Providence, RI.

●

Polimize Brown PLM

A new color has been added to the Althouse Chemical Co line for the application by the Polimize* yarn dyeing process. Designated as Polimize Brown PLM, the new color is for application of a direct brown for cotton, by use of the Polimize package dye and packaged-dyed cotton yarn process.

It is said to be an ideal base for the dyeing of washfast browns on cotton yarn, not only because of its very good tinctorial strength and pile on properties, but because of the even exhaust and level dyeing properties throughout the dyeing operation.

When developed by the Polimize procedure, it reportedly has excellent fastness to washing and is superior in this respect to brown shades formulated with oranges, yellows, reds, etc.

It is said to offer good lightfastness, when Polimize developed. Products knit from Polimize-dyed cotton yarns are notable for their suppleness and softness, it is claimed.

*Reg TM, Althouse Chemical Co

●

Javatex Non-Fray

Javatex Non-Fray, a new "non-fray" coating for cotton, wool, rayon, Orlon, fiber glass and other synthetic fabrics, has been developed by Java Latex & Chemical Corp, 1713 West Farms Rd, New York, NY.

It reportedly may be applied by dipping, roller coating or spray and dries clear and transparent. The coating, which is designed to prevent threads and fibers from unraveling, is said to be nonblocking and resistant to drycleaning and washing.

Javatex Non-Fray is claimed to be excellent for use in the manufacture of upholstery fabrics, ribbons, woven labels, shoe fabrics and other materials. It is available in 55-gallon drums as well as one- and five-gallon containers.

●

Steri-tized 505, 510, 515 and 520

A new series of mecury compounds for the textile industry has been announced by Griffin Chemical Corp, 640 Central Ave, Peekskill, NY.

Designated Steri-tized 505, 510, 515 and 520, these formulations are said to be economical, simple and effective for use on all natural and synthetic fabrics, fabric finishes and coatings where mildew prevention, fungus prevention and inhibition of bacteria are desired. It is claimed that the Steri-tized products are compatible with the broadest spectrum of finishes, fabrics and applications.

According to M Kadison, Griffin president, these products are completely water soluble for ease of application, and they can be applied in the dyebath with water repellent or any other type of finish. Upon drying, these products are claimed to be fast to leaching, thus assuring lasting protection against microbial degradation. Griffin provides a free continuous bacteriological testing service for users of Steri-tized products, who may also merchandise the Steri-tized trademark.

GSP Shear-Flow

Shear-Flow Continuous Mixer

Gabb Special Products, Inc, Windsor Locks, Conn, recently introduced a new Shear-Flow continuous mixer that has been specifically designed to provide high shear action in continuous mix operations.

Incorporating the same design principle as the portable Shear-Flow, the new continuous mixer is said to be capable of mixing any liquid that can be pumped, with results better than or comparable with that of equipment costing considerably more.

The relatively small RL Hi-Shear mixing head is enclosed within a sealed chamber that contains an inlet for the introduction of material and an outlet for the passage of the finished mixture. Being a completely sealed unit, the Shear-Flow reportedly eliminates the possibility of air entrainment and is said to be suitable for use on pressure systems, inversion applications, and introduction of gasses to liquids. It reportedly enables inflammable materials to be used with complete safety. A compact and completely self-contained unit, the Shear-Flow lends itself to systems requiring jacketed heating or cooling. In applications where an exceptionally fine blend at a high rate of flow or the introduction of different materials must be made separately and at specific times along the route of flow, more than one Shear-Flow unit can be installed in series to accommodate such process requirements, it is stated.

Although small in size, Shear-Flow is claimed to be capable of handling high-viscosity materials in a minimum of time, providing a complete recirculation and thorough blending, homogenizing, emulsifying or dispersing. Mixer size or number of units required is dependent on intimacy of mix demanded, rate of flow, viscosity, etc.

The RL Hi-Shear Head can be powered with motors ranging from 1 to 10 horsepower depending on the power requirement demanded by the application.

●

New System Provides Low-cost Transparent Backing for Carpets

A new system for low-cost transparent backsizing of velvet, wilton, and contract-type carpets, developed by Morningstar-Paisley, Inc, is designed to improve the appearance of the carpet back, resulting in increased saleability. Cost of the new Morningstar-Paisley system is said to run as low as two and one-half cents per square yard. The material reportedly has excellent aging characteristics, with no yellowing after prolonged exposure in a Fade-Ometer test (over 150 hours at 150°F).

The M-P system provides for a variety of different back properties (variations in hand, pile locking qualities, etc) by varying the proportion of ingredients. The backing system is supplied in a variety of viscosities to meet the needs of a particular application method. It is claimed that the system will not skip, even on carpet backs that have variations in levelness.

The material reportedly does not present problems commonly encountered in backsizing operations, such as lumping, gritting, or pick-off. The backing can be pigmented white with titanium dioxide without affecting the other characteristics of the unpigmented material, it is claimed. It is said to be usable on all backsizing equipment.

Further information about the new backsizing system can be obtained by writing Textile Dept, Morningstar-Paisley, Inc, 630 West 51st St, New York 19, NY.

Gafac Surfactants

Antara Chemicals Division of General Aniline & Film Corp, New York, recently announced the introduction and availablity of a completely new series of surface-active agents. These new anionic surfactants (see listing in Dec 12 issue, page 64) are being sold under a newly established trade mark as Gafac surfactants.

The initial application areas for the first entrants in this new product line include cotton boil off and bleaching, wool scouring, antistatic-emulsifier-lubricant, heavy-duty liquid detergent cleaning compound, emulsion polymerization, and drycleaning fields.

In the textile field, the Gafac surfactants are designed to be of value in fabric preparation and finishing applications. It is claimed that the compounds' exceptional solubility, chemical stability, antistatic and lubricating properties, and oil and water emulsification characteristics will be of particular value to the textile processors.

The Gafac surfactants are said to be excellent emulsifiers and detergents, which may be prepared with varying degrees of solubility in aromatic, aliphatic and chlorinated solvents, water, and strong aqueous solutions of alkaline builders, such as sodium hydroxide, polyphosphates and silicates. Gafac surfactants are supplied as the 100% free acid or as a sodium salt.

Surfactants Gafac GB-520, PE-510, LO-529, RE-610 are now commercially available and two others, Gafac RM-510 and Gafac RM-710, are being readied for commercialization.

Gafac GB-520 (formerly Alipol GB-520), available as a 95% active sodium salt, was developed particularly as an emulsifier-antistatic lubricant, useful in the processing of nylon 6 and other synthetic fibers.

Both Gafac RE-610 and Gafac PE-510 are reported to be effective surfactants for use in kier boiling and continuous caustic boil off of cotton piece goods. Here, advantage is taken of their solubility in caustic solutions and their emulsification, wetting, and detergency characteristics. Gafac RE-610 is also finding use as the detergent for scouring and bleaching of synthetic fabrics.

Gafac LO-529 is the 88% active sodium salt of Gafac PE-510. It was known formerly as Alipal LO-529.

●

Oleyl- and Fatty C-16 C-18 Hydroxamic Acids

Two fatty hydroxamic acids, oleyl- and fatty C-16 C-18-hydroxamic acids, are now available commercially. They are said to be interesting chemical intermediates because they have a reactive OH and NH group, as well as a long-chain fatty group. They reportedly can react with alkalis, metallic ions and acylating agents. Some of the metallic salts are highly colored. On heating they are said to form isocyanates which can be reacted further with alcohols and amines to form urethanes and ureas respectively. The isocyanates form carbamic acids with water.

Industrially, fatty hydroxamic acids may be used for surface-active compounds, pigment dispersants, dyeing aids, detergents, chelating agents, etc.

These acids have been developed and are being manufactured by Woburn Chemical Corp, Harrison, NJ. Samples and data sheets are available on request.

●

Cibacron Brilliant Orange GP

Cibacron Brilliant Orange GP, a bright brilliant orange reactive dye for dyeing and printing on cellulosic fibers, has been introduced by Ciba Co Inc. It is brighter than Cibacron Brilliant Orange G.

A particular advantage of the new color, the company says, is the ease in which unfixed color can be washed away. The new coloring agent is also said to be suitable for goods to be rubberized or resin-finished.

Although the new color was designed for dyeing natural cellulosic fibers by the usual continuous methods, it reportedly can be effectively applied to wool either by itself or in combination with other dyes when the Neovadine method is used. Although regenerated cellulosic fiber can be dyed by both padding and batch-wise exhaustion, the company has recommended the latter.

Extensive tests reportedly have shown that material treated with the new color is fast to light, washing, water, perspiration and drycleaning. In combination with other dyes, the company reports, the new dye has been found excellent for the production of scarlet shades using the Cibacron Scarlet and Cibacron Brilliant Red brands.

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WANTED: CHIEF CHEMIST AND RESEARCH DIRECTOR with thorough knowledge of textile specialty chemicals. Excellent opportunity with young progressing company in metropolitan area. Replies held in strictest confidence. Write Box No. 113

WANTED: MALE TEXTILE CHEMIST—recent graduate, training in technical application laboratory. Excellent opportunity for qualified individual with progressive dyestuff manufacturer. Write Box No. 114

WANTED: RECENT TEXTILE CHEMISTRY GRADUATE—to assist manager of Metropolitan area finishing plant with laboratory and administrative duties. Write Box No. 118

• PERSONNEL AVAILABLE •

POSITION WANTED: COLORIST—Textile screen and roller print. Thoroughly experienced with all classes of dyestuffs on all type fabrics. Experience includes supervision of printing, ageing, steaming and washing. Some knowledge of dyeing. Capable, efficient, reliable. Write Box No. 111

POSITION WANTED: PLANT CHEMIST—COLORIST-DYER. College graduate, over 25 years of experience in printing (Roller & Screen), dyeing and laboratory development-research work. Wishes position of responsibility. Will relocate. Write Box No. 115

DYEING CONSULTANT
BECK DYEING
Paul R. Andres
P. O. Box 154
Covington, Va.

POSITION WANTED: SUPERINTENDENT OR ASSISTANT MANAGER. Experienced in all phases of cotton blends. Color shop, printing, dyeing, finishing with some experience on synthetics. B. S. in Textile Chemistry. Will relocate. Will consider sales. Write Box No. 116

POSITION WANTED: CHEMIST—Junior—Philadelphia Textile Institute, will receive B. S. in chemistry and dyeing, completely fulfilled military obligations, good marks, ambitious, married. Desire summer position for gaining further experience and possible permanent position after graduation. Prefer Philadelphia area. Write Box No. 117

POSITION WANTED: DYER OR TEXTILE CHEMIST from New Jersey, experienced in dyeing and finishing synthetic fabrics. College, laboratory, plant background. Desires position in company located California. Write Box No. 119

Uversoft Softeners

A new series of modified cationic softening agents meeting the varying specifications of home laundry softeners and also suitable for textile mill use is being marketed by The Harshaw Chemical Company. Five Uversoft softener bases have been developed in an effort to provide such desirable end-use characteristics as high substantivity, rewettability of fabrics, high degree of softness and handle, low cost, shelf stability, and compatibility with residual household detergents.

The Uversoft type softeners are said to be basically quaternary ammonium salts containing two long straight chains within the same molecule. Derived from hydrogenated tallow, the stearyl chain is the predominating grouping. Chemical modification and interblending with other vital chemical components is said to produce the proper degree of solubilization to achieve easy dispersibility of the product. The two long fatty chains exposed after the softener attaches itself to the substrate material reportedly account for the softening properties. The substantivity is said to result from differences in charge between the textile or paper (negative charge) and the positive-charged fatty quaternary ammonium ions. These materials are all paste-like at room temperature, liquifying readily upon heating. They are either stable in acid and alkaline media, and in the presence of lim-75% or 80% solids in isopropanol. They are reported to be ited amounts of polyvalent ions.

Uversoft bases will impart softness in one application, it is claimed, and softened synthetic fabrics cling much less because of the antistatic properties of Uversoft base softeners.

For further information, write to The Harshaw Chemical Co, 1945 East 97th Street, Cleveland 6, O.

●

Solution-dyed Colors in Polyester Fiber

Solution-dyed colors in polyester fibers are being introduced commercially by Eastman Chemical Products, Inc, 260 Madison Ave, New York 16, NY.

Following closely the inception of solution-dyed Black Kodel in men's wear blends on the woolen and worsted systems, it is anticipated that the introduction of Kodel navy and Kodel brown will substantially increase styling possibilities for designers in a wide range of fabrics.

Solution-dyed Kodel is said to permit unique color effects heretofore impractical in polyester fibers and to offer built-in uniformity of color and fastness that cannot be achieved by any other method of dyeing polyesters. The deep penetration of solution-dyed Kodel colors also is said to make them impervious to all finishing processes such as the use of bleaching agents or other chemical solvents that normally affect colors.

The new solution-dyed Kodel colors will be produced in three-denier staple and tow, at $1.86 a pound for brown and $1.96 for navy. Solution-dyed Black Kodel is available in 2.25- and three-denier staple and tow at $1.76 a pound.

●

Reevair

Announcement was made recently by Reeves Brothers, Inc of a new waterproof finish for outerwear called Reevair. The Company states that the significant facts about this new waterproofing is that it breathes; water cannot penetrate, yet body vapors pass through the finished fabric, and it gives the wearer comfortable, stormproof garments.

It is claimed that every proper washing or drycleaning actually improves Reevair's ability to transmit body vapors.

The origin of the Reevair finish was in an electric battery process developed by the Electric Storage Battery Co in Philadelphia. Reeves saw the potentialities of the process as applied to textiles, and thus the ESB-Reeves Corp was formed. Basic patents covering the Reevair process are controlled by ESB-Reeves Corp.

Official introduction to the trade of the new Reevair-treated fabrics took place at the National Outerwear Sportswear Association show where several manufacturers of outerwear clothing had garments on display.

●

Orlon Sayelle Type 24

A new-type Orlon Sayelle bicomponent acrylic fiber for use in fine gauge, full-fashioned sweaters was announced recently by the Du Pont Company. It is called Orlon Sayelle Type 24.

The new product is available in three-denier cut staple priced at $1.45 a pound. The company said six-denier staple and tow, Type 24, will go into production in the near future.

Textile Chemist

Long-established progressive chemical manufacturer serving the textile and paper trades offers an opportunity to a man qualified for technical sales and service.

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